



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

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EPA Region 5 Records Ctr.



223135

August 11, 2004

REPLY TO THE ATTENTION OF:

**CERTIFIED MAIL**  
**RETURN RECEIPT REQUESTED**

(SR-6J)

Mr. Steve Smith  
Solutia, Inc.  
W.G. Krummrich Plant  
500 Monsanto Avenue  
Sauget, IL 62206-1198

Mr. Glen Kurowski  
Monsanto Company  
800 North Lindbergh Blvd  
St. Louis, MO 63167

Mr. Gary D. Uphoff  
Environment Management Services Company  
5934 Nicklaus Dr.  
Fort Collins, CO 80528

RE: Notification of RIFS Document Revisions and Additional Work - Sauget Area 2  
Site, Sauget, Illinois

Dear Mr. Smith, Kurowski, and Uphoff:

On November 24, 2000, the United States Environmental Protection Agency (U.S. EPA) and the Sauget Area 2 Sites Group (the Group) of Potentially Responsible Parties (PRPs) signed an Administrative Order on Consent (AOC), Docket Number V-W-01-C-622, requiring the performance of a Remedial Investigation/Feasibility Study (RIFS) at the five waste disposal Sites O, P, Q, R, and S known as the Sauget Area 2 (SA2) Sites.

The Group submitted the draft SA2 RI/FS report (the Report) on January 30, 2004. In April 2004, U.S. EPA completed its review of the Report and submitted comments to the Group. The U. S. EPA has raised numerous concerns over the document quality, the general nature of data presentation and analysis, the absence of detailed descriptions of site history and background, and the superficial interpretations of the investigation results that made the evaluation of the Group's broadly drawn conclusions very difficult to complete.

In May 2004, the Group submitted responses to comments (RtCs). The Group's RtCs document did not adequately address U.S. EPA comments on the Report, nor did it commit the Group to take any significant actions that would improve the document's quality and address data gaps.

The Group has not attempted in good faith to respond to U. S. EPA comments, revise the document, and to address data gaps as required by the AOC. The Report as written, coupled with the limited data presented, does not meet AOC objectives and is unprecedented for this type of investigation.

Due to the Group's lack of response to comments and the Group's failure to revise the document, the U. S. EPA has prepared additional responses to the PRPs' RtCs document (attached). The purpose of this document is to clearly state the U. S. EPA's position on the necessary improvements to the report and to identify major deficiencies in the Report that must be addressed.

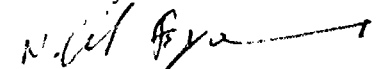
In addition, the U. S. EPA has identified data gaps that must be addressed in order to accomplish the objectives of the Report and meet the AOC requirements. The attached supporting document, Additional Remedial Investigation at the Sauget 2 Sites, provides U. S. EPA's recommendation regarding the additional investigation that must be taken to fill the data gaps in order to satisfy the AOC.

Pursuant to Section V, paragraph 2.2 RI/FS Report and Section 2.5-Additional Work of the November 24, 2000, AOC for the SA2 Site, the U.S. EPA has determined that Report revisions and additional work is necessary to accomplish the objectives of the Report and AOC. This Additional Work must be consistent with Section V, paragraph 2 and the SOW for the AOC. This Additional Work is required by the AOC to characterize principal threats, such as non-aqueous phase liquid (NAPL) and buried drums and to ensure that the RI data address potential threats and is of sufficient quantity and quality to allow effective evaluation of remedial alternatives.

Within 30 days of receipt of this letter, Respondent(s) shall submit to U. S. EPA for approval a revised RIFS Report and a work plan to address data gaps in accordance with the attached documents.

I propose the week of August 30<sup>th</sup> (August 31, or September 1) for scheduling a meeting in St. Louis to discuss this letter and the attached technical comments and documents. If you have any questions regarding this letter, please do not hesitate to contact me at 312/886-6840.

Sincerely,



Nabil Fayoumi  
Remedial Project Manager  
Superfund Division

Enclosures

cc via e-mail:

Sandra Bron, IEPA  
Mike Coffey, USFWS  
Michael Henry, IDNR  
Karen Torrent, USDOJ  
Chris English, Ch2MHill

bcc:

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Ken Bardo, USEPA  
Thomas Martin, USEPA  
Thomas Short, USEPA

# Introduction

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On January 30, 2004 the Sauget Area 2 (SA2) Sites Group (the Group) submitted a Draft Remedial Investigation/Feasibility Study (RI/FS) Report, hereinafter cited as the RI/FS Report. The U.S. Environmental Protection Agency (USEPA) submitted comments on the RI/FS Report on April 7, 2004. Subsequently, the Group submitted Responses to Comments (RtCs) on May 7, 2004.

The May 2004 RtCs document did not adequately address USEPA comments on the RI/FS Report, nor did the RtCs commit the Group to taking sufficient actions that would improve the document's quality. Because of the nature of the Group's responses, USEPA has prepared additional responses to the PRPs RtCs. The purpose of these USEPA Responses to RtCs is to clearly state USEPA's position on the necessary improvements to the RI/FS Report. A supporting document, *Additional Remedial Investigation at Sauget Area 2 Sites*, provides the additional investigation that should be taken to fill data gaps that have been identified in the RI/FS Report and the *Support Sampling Data Report*, dated April 1, 2003 (URS, 2003).

The two documents clearly state USEPA's position regarding the inadequacies of the Draft RI/FS Report and the need for further field investigation to address data gaps. The two documents are organized as follows:

1. USEPA Responses to RtCs:

- Compliance with Administrative Order on Consent (AOC) – general discussion
- RI/FS Report Deficiencies – provides an overview of USEPA's requirements for improving the quality of the RI/FS Report
- Specific Responses – provides USEPA responses to the Group's May 4 2004 RtCs

2. Additional Remedial Investigation at Sauget Area 2 Sites:

- Identifies data gaps following a review of 2002 RI/FS Report and provides USEPA's requirements for additional field work to fill the identified RI data gaps

# Compliance with AOC

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In the introduction of their May 2004 RtCs submittal, the Group stated that the RI/FS at SA2 was conducted in “full compliance with the [SA2 Administrative Order on Consent (AOC), docket Number V-W-01-C-622, signed by the USEPA Region 5 on November 24, 2000] and in accordance with the USEPA-approved Support Sampling Plan.” The following paragraphs identify areas where such compliance appears absent.

The AOC, page 11, requires that the RI/FS Report “shall be consistent with, at a minimum, the USEPA guidance entitled ‘Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA’ [OSWER Directive No. 9355.3-01, October 1988] and any other guidance that U.S. EPA uses in conducting a RI/FS”. Additional guidance is provided in USEPA’s document, “Conducting Remedial Investigation/ Feasibility Studies for CERCLA Municipal Landfill Sites (OSWER Directive No. 9355.3-11, February 1991).”

OSWER Directive No. 9355.3-01 is pertinent to sites where the presumptive remedies for landfills, namely landfill capping and groundwater containment, are not being implemented. Presumptive remedies are defined in the USEPA guidance document, *Presumptive Remedy for CERCLA Municipal Landfill Sites* (OSWER Directive No 9355.0-49FS, September 1993). Site P is a site that falls under this category, because the Group did not consider a presumptive remedy for Site P in the RI/FS.

OSWER Directive No. 9355-3.11 applies to sites where a landfill cap and groundwater containment are recommended (i.e., Site R). Under this guidance document, streamlining the RI/FS is considered appropriate.

USEPA agreed in principle to the Streamlined RI/FS within the context of the presumptive remedy guidance for CERCLA Municipal Landfills. The streamlined approach presumes that containment such as landfill capping and groundwater collection and treatment (see Highlight 1, Page 3 of OSWER Directive No. 9355.0-49FS) will be implemented. The guidance states that “the process for achieving these goals [the RI/FS goals] can be streamlined for CERCLA municipal landfill sites because of the upfront presumption that landfill contents will be contained.”

However, based on the draft RI/FS Report, no containment of landfill contents is proposed for Sites P, Q Central and Q South. Similarly, no containment of groundwater is proposed for Sites P, O (although containment for Site O beyond the point of compliance would be achieved by the Groundwater Migration Control System [GMCS] and barrier wall at Site R), S (although containment beyond the point of compliance may be achieved by the GMCS and barrier wall at Site R), Q Central, Q South and portions of Q North. Thus, the streamlined approach for sites other than Site R is inappropriate.

In addition, the guidance requires that media representing a “principal threat” be treated (see below for further discussion of principal threats). Some streamlining of the RI/FS process can be achieved for large sites that will not be presumptively contained. To accomplish this goal, however, the USEPA needs to work cooperatively with the Group to determine the appropriate degree of streamlining and to ensure that the resulting RI data

fully address potential threats and is of sufficient quantity and quality to permit effective evaluation of remedial alternatives at the FS stage.

# RI/FS Report Deficiencies

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## Data Summaries

Pre-RI data for SA2 was not summarized by the Group in the RI/FS Report. The Group should use, as appropriate, pre-RI and supplemental data to support their conclusions in the RI/FS Report and to fill indicated RI data gaps. Additional field investigation is needed, the scope of which is described in the attached document, *Additional Remedial Investigation at Sauget Area 2 Sites*. It is conceivable that the proposed scope may be modified based on a comprehensive presentation and evaluation of the pre-RI data.

The Group must provide more detailed site histories (e.g., disposal practices) in the RI/FS Report using pre-RI data that exist for the SA2 sites. This information is important because it allows USEPA to make informed judgements relative to the adequacy of site investigations, the resultant data, and the relevancy and appropriateness of landfill closure requirements for each of the sites. The site characterization as presented in the Focused Feasibility Study (FFS) (Solutia, 2002) and Support Sampling Plan (SSP) (URS, 2002) should be utilized as a basis for this evaluation of Pre-RI data. Information from relevant historical documents should be incorporated, and the reports previously reviewed by the Group should be included in summary form within the RI/FS Report. Additionally, data collected from non-RI fieldwork must be incorporated into the data summary. For example, field data obtained for use in the barrier wall design is relevant to the broader RI/FS and therefore should be included and discussed.

The Group should review the historical information to evaluate disposal practices, if such information is available, and use past historical information to evaluate specific areas of concern (e.g., areas where known dumping or prior incomplete or insufficient investigations occurred) to augment the 2002 RI data in assessing these as potential areas where future investigation may be required.

From these documents, the Group should summarize the following information, at a minimum:

1. Information regarding previous site use, particularly disposal practices (e.g., types of waste, approximate volume of waste disposed, estimated time periods of disposal)
2. Previous investigations and findings within suspected source areas, with results depicted on figures incorporated in the RI/FS Report.
3. Removal action activities and results of verification sampling following removal action
4. Historical data summarized must be compared and contrasted to RI/FS data in order to evaluate potential data gaps that still exist

The site histories must be objectively and comprehensively evaluated. Examples of the type of issues that need to be addressed by a more thorough review of historical information are presented in the following paragraphs.

## Site Q Ponds – 2000 Removal Action

Ecology and Environment, Inc. July 31, 2000. *Final Federal On-Scene Coordinator's Report for Area 2 Site Q, Cahokia, St. Clair County, Illinois.*

This report is poorly summarized in the RI/FS Report and omits certain facts. For example, information regarding the residual concentrations of contaminants in soils should be discussed. The RI/FS Report does not discuss the following information: 24 subsurface soil samples were collected in the former excavation area after the removal action ended; the residual concentrations of total polychlorinated biphenyls (PCBs) in these samples ranged from 0.102 to 456 milligrams per kilogram (mg/kg), with eight of the 24 samples exceeding the Removal Action (RA) action limit of 50 parts per million (ppm).

Additionally, the RI/FS Report unacceptably misrepresents historical information. For example, the RI/FS Report states "due to limited resources and the amount of contamination, this removal action did not address all of the contaminants present on the site. As a result, municipal waste is visible on limited portions of the site." This statement inaccurately suggests that only municipal waste remains at the site. However, the removal action report (as cited above) states that the RA was terminated due to limited resources/funding and "could not address all the contamination present on the site."

## Site Q Central – 1995 Removal Action

USEPA, Region V. June 15, 1995. *Draft On-Scene Coordinator's Report for CERCLA Removal Action, Sauget Landfill, Site Q, Sauget, Illinois.*

This removal action, though mentioned in the RI/FS Report, is not summarized in the Previous Removal and Remedial Action section. This RA was required when, after the 1993 flood of the Mississippi River, Site Q was submerged under approximately 5 feet of water. The waters eroded a portion of the original cover material and exposed approximately 12 deteriorated drums. Drum samples collected during a subsequent site assessment indicated high concentrations of PCBs, with PCB 1260 found between 180,000 to 260,000 ppm in three samples. A USEPA site visit indicated the area was apparently graded along the deteriorated bank of the landfill as part of an expansion project for storage of landscape material, spreading the contents of the previously exposed drums over the riverbank and beach.

This removal action should be summarized in the RI/FS Report. Future investigative work should evaluate this area as a potential source area and address the potential that the 1995 RA was incomplete or insufficient.

## Krummich Plant Ecological Risk Assessment, 2001, adjacent to Site R.

Menzie-Cura & Associates, Inc. June 1, 2001. *Internal Review Draft – Ecological Risk Assessment for W.G. Krummich Plant.*

The previous ERA, conducted on the Mississippi River adjacent to Site R, should be summarized in the RI/FS Report. Conclusions of the Menzie-Cura ERA should be compared and contrasted to findings in the baseline ecological risk assessment (BERA) (AMEC, 2003).



## Data Summary / Site Investigation in 1988

Ecology & Environment, Inc., May 1988. *Expanded Site Investigation Dead Creek Project Sites at Cahokia/Sauget, Illinois. Volumes 1 & 2.*

Data from the Ecology and Environment (E&E) report should be comprehensively incorporated into the RI/FS Report and the information presented must be objectively evaluated as it pertains to the Remedial Investigation at the SA2 sites.

For instance, Site O historical data, though partially presented in prior reports by the Group (FFS and SSP), must be fully assessed for information regarding prior site activities. As documented in the E&E report, an area of contamination was depicted west of the former Sauget Wastewater Treatment Plant, an area which was contained within Site O (described as approximately 45 acres at the time). In 1983, surface and subsurface soil samples were collected in this area with PCBs found at concentrations up to 149.6 ppm and 2,3,7,8-tetrachloro dibenzo-p-dioxin detected up at a maximum concentration of 170 parts per billion (ppb) in one composite surface soil sample. It was estimated at this time that 2,800 cubic yards of contaminated soil existed in this area. The 1988 E&E report concluded that the extent of contamination in this area had not been assessed. Historical sample location figures previously generated by the Group depict numerous sample locations outside the currently drawn Site O boundaries, and these areas currently have not been adequately evaluated. Justification for limiting the Site O boundary must be presented in the RI/FS Report.

## Level of Detail

An insufficient level of detail was presented in the RI/FS Report with a majority of the data presented in summary form. At a minimum, an adequate level of detail would constitute data tables on specific contaminants, tables of concentrations greater than Maximum Contaminant Levels (MCLs) or Preliminary Remediation Goals (PRGs), and contour maps of MCL/PRG exceedances for select compounds. The main body of data from the sampling and analysis was presented in the Support Sampling Data Report; these data need to be included in the RI/FS as one comprehensive report for SA2.

## Potential for Erosion and Release

The Group needs to summarize both Removal Actions (RAs) that have occurred at Site Q. The RI report should include the following information: maps showing locations of drums or footprints of previous removal actions, maps of erosion locations, an analytical summary of soil and drum contents, and approximate disposal estimates. The historical information and maps should be compared to the magnetometer survey and the mapped locations of observed anomalies. Areas and frequency of flooding should be evaluated.

It is noted that the 2000 RA at Site Q South was terminated due to lack of funding and it was known that contamination remained at the site; the 1995 Site Q Central RA documentation shows removal of *visual* contamination and it should be evaluated whether this removal action was sufficient. The floodplain map should be evaluated to determine how often the

ponds are flooded by the Mississippi River (fish entering the pond provide evidence that such flooding occurs).

The Group should prepare a Technical Memorandum (as an appendix to the RI/FS Report) evaluating whether the RAs sufficiently addressed the potential for erosion and release during a flood event. If the Group concludes that there is no potential for further erosion and release, it should be explained and supported in the Technical Memorandum.

## Principal Threats

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that USEPA expects to use "treatment to address the principal threats posed by a site, wherever practicable." According to *A Guide to Principal Threat and Low Level Threat Wastes* (OSWER Directive No. 9380.3-06FS, November 1991), a "principal threat" waste is defined as "those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur."

Principal threat wastes include liquids contained in drums or tanks and free product (i.e., dense and light non-aqueous phase liquid; DNAPL and LNAPL). Evidence of these principal threats were noted in the 2002 RI field investigation and in previous investigations across SA2. As noted in USEPA's comment on the RI/FS Report, additional information regarding principal threats needs to be provided in the report, and additional investigation needs to be undertaken in order to characterize the potential threats that are present on-site.

## Potential for Buried Drums

The potential for buried drums was not adequately addressed in the RI/FS Report. A magnetometer survey and soil gas sampling were performed during the RI to identify the locations of buried drums or other localized areas of contamination. In addition to the magnetometer survey, soil gas samples were spread across SA2 over a 200-foot grid.

A large number of magnetic anomalies were identified during the magnetometer survey. However, only 11 trenches were subsequently completed to investigate these anomalies. While these trenches may have been agreed upon by the USEPA and Group during the work plan development phase, this number of trenches does not provide sufficient information to support the no further action recommendation in the RI/FS Report for several of the SA2 sites (Sites P, Q Central, and Q South). In addition, these trenches are insufficient to adequately characterize the potential for release to groundwater beneath sites recommended in the RI/FS Report for a Resource Conservation and Recovery Act (RCRA) Cap (Sites O, O North, Q North, R, and S). Recommendations for minimum additional trenches are provided in the attached document, *Additional Remedial Investigation at Sauget Area 2 Sites*.

## NAPL

The presence of NAPL has been observed or suggested during various fieldwork activities at SA2, including:

- During the 2002 RI field investigation, NAPL was observed at Site S and the Site Q North Dogleg during trenching. NAPL was also observed in waste characterization borings located at Site Q Dogleg and Site R. No samples were collected for analysis.
- DNAPL has been observed in two leachate wells during quarterly sampling (Site Q and Site R).
- In May 2002, DNAPL was found during sonic drilling prior to construction of the Site R barrier wall. DNAPL was observed at boring location, Sonic 5, from 138 to 141 feet below ground surface. Analysis of an oil sample collected from Sonic 5 revealed concentrations of chlorobenzene at 1,600 milligrams per liter (mg/L), 1,2-dichlorobenzene at 21,000 mg/L, 1,2,4-trichlorobenzene at 4,500 mg/L, trichlorobiphenyl at 17 mg/L, and tetrachlorobiphenyl at 25 mg/L. Currently the placement of information relating to DNAPL observed in the Sonic 5 boring is located within the "Leachate" section of Site R (Page 6-20) of the RI/FS Report, though the report states the boring is located "just beyond the southeastern corner of Site R." This data should hence be appropriately categorized as Site Q under the NAPL discussion.
- Adjacent to Site Q North, elevated concentrations of chlorobenzene were observed in river samples: R3BM1S [sediment] at 11 mg/kg, R3AM1W [surface water] at 6.1 micrograms per liter (µg/L). This observation suggests that chlorobenzene detected in the river samples may tie in with the observation of DNAPL upgradient, potentially at the Sonic 5 boring.
- Chlorobenzene in groundwater samples at Site R and downgradient of Site P exceeds the one-percent solubility rule for the presence of NAPL. (The one-percent solubility rule is exceeded for chlorobenzene at 4,700 µg/L.) Groundwater sample analyses at locations AA-P-1 (4,900 µg/L at 104 feet) and AA-R-1 (13,000 µg/L at 48 feet) both indicate the potential presence of DNAPL.

All NAPL data should be elaborated upon and placed in a separate section of the RI/FS Report. All historical information on NAPL (light or dense) should be included in the RI/FS Report in addition to a fieldwork evaluation of NAPL characterization at Sauget Area 2. A discussion of the nature and extent of NAPL, vertically and horizontally, and a characterization of the material should be included in the RI/FS Report. Once the existing NAPL data has been compiled and presented, the need for additional characterization of the horizontal and vertical extent can be determined.

## RI Data Presentation

Principal contaminants should be delineated and presented individually in the RI report text, figures, and maps. Principal contaminants, as listed below, should at a minimum be delineated and mapped on separate figures, and these contaminants should be individually discussed within the report text contained within the RI/FS Report. The revised RI/FS

Report should be a stand-alone document that includes all data, rather than just summary tables with references to earlier documents.

Figures should be presented for groundwater concentrations that exceed regulatory standards (e.g., PRGs, which include MCLs). The Group should recognize that that PRGs are long-term goals that need to be achieved in a reasonable timeframe. Although active remediation to PRGs may not be required at one or more sites, these figures must be presented as a necessary component of the FS report for the development and screening of remedial alternatives.

Principal contaminants, to be contoured to the drinking water PRG concentrations and separately evaluated, at a minimum, must include:

- Chlorobenzene
- P-chloroaniline
- Benzene
- 1,4 Dichlorobenzene
- Vinyl Chloride
- Arsenic
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Cis-1,2-dichloroethene
- 1,2-Chloroethane
- 2,4,6-Trichlorophenol
- Nitrobenzene
- 2,4-D
- 2,4-Dichlorophenol

Additional information regarding PRGs is provided later in this document, under the *Specific Responses* section.

## Groundwater Model

USEPA comments on the groundwater model in the RI/FS Report fall under two primary problem areas: 1) insufficient data was collected from the field to support assumptions and conclusions drawn from the model; and 2) insufficient information is provided in the report to evaluate the appropriateness and accuracy of the model. Requirements outlining the additional data needs for characterizing groundwater are included in the attached document *Additional Remedial Investigation at Saugyet Area 2 Sites*.

Additional groundwater characterization is needed to address the following objectives:

- Evaluate the potential for an ongoing release from the source area to determine whether additional source remediation and / or control will reduce contaminant flux to the aquifer.
- Fill data gaps identified in the RI/FS groundwater characterization.
- Evaluate the impact of aquifer anisotropy on the direction of plume movement.

Wells should be installed to refine the Conceptual Site Model regarding the movement of groundwater and definition of the plumes. The groundwater characterization and evaluation of remedial alternatives centers on the assumption that groundwater flows at right angles to the potentiometric contours (i.e., flow is at right angles to and towards the river). Alluvial depositional environments are typically anisotropic as a result of the heterogeneity (lateral and vertical) of the aquifer matrix. Often, groundwater flow tends to be parallel or sub-parallel to the river channel. An indication of the potential for anisotropic flow can be seen in the plume maps from the RI/FS Report. For example, Figures 7-1a and 7-1b show an elongation in the plume originating at or upgradient of Site O. The plume is elongated to the north in the direction of Site P. The effect of anisotropy has a large impact on the capture of groundwater by the Groundwater Migration Control System (GMCS) and whether groundwater near Site O is captured by the recovery system.

Insufficient data are provided in the RI/FS Report to determine whether the model accurately represents site conditions. For example, mass flux estimates were calculated, but insufficient data were presented in the report to show how the estimates were developed (Site R) and at other sites, data from one set of monitoring wells was all that was used to calculate the estimate (for example, Site Q).

For groundwater modeling purposes, groundwater data from Sauget Area 1 (SA1), SA2, and the Krummrich Plant should be used together to provide a regional perspective of groundwater conditions. The Group should model the area extending from the eastern side of SA1 to the Mississippi River. Only with this regional information can a remedy such as Long Term Monitoring (LTM) and Source Control be selected as the preferred remedy for SA2.

The groundwater model must assess whether current groundwater conditions are “worst case” or whether groundwater conditions could potentially degrade further over time. This evaluation can only be performed if additional information related to principal threats is collected. Such measures are outlined in the attached *Additional Remedial Investigation at Sauget Area 2 Sites*.

## **Data Validation**

In general, insufficient information was provided in the RI/FS Report to determine whether the Group followed their data validation plan. The data validation would have to be re-performed to enable a comparison of the data as presented in the RI report. For the most part, only vague statements were presented in the data validation section of the RI/FS Report, and there is no way to tell, without detailed tables presenting the data, exactly what occurred with the data in a particular area or station.

In their data validation documentation, the Group should provide all data validation in a tabular format, not only a discussion of the rejected data. The data should be presented as an appendix to the RI report, rather than as a separate stand-alone document, so all data can be available for review at one time.

# Specific Responses

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USEPA and their consultants have reviewed the Group's responses to USEPA comments on the Sauget Area 2 RI/FS Report. Responses to the Group's responses are presented below.

These responses are submitted together with an attached document, *Additional Remedial Investigation at Sauget Area 2 Sites*, presenting additional investigations and evaluations that will be needed at a minimum to satisfy the objectives of the RI/FS, as required by the AOC.

USEPA responses are provided below following each original USEPA review comment and the subsequent response to the Group's response to the original comment. These responses should be considered by the Group with the general information provided in the previous sections of this document.

## RI/FS Report

### General Comments

1. **USEPA Comment: Level-of-Detail.** The RI/FS report has not presented the results of the RI field investigation, the evaluation of the RI data or the development and evaluation of alternatives in sufficient detail to allow meaningful review. As a result, only general comments are presented below. Once a sufficiently detailed RI/FS is submitted, detailed review can be undertaken.

**The Group's Response:** The RI/FS document presented the results of all data collected under the USEPA-approved Support Sampling Plan. The Group believes that this document, as written, is adequate to support the purposes of the investigation, in particular the evaluation of potential risks and development and screening of remedial alternatives.

**USEPA Response:** The level of detail of presented throughout the RI/FS Report is insufficient. The RI/FS as outlined above, must be revised to present an appropriate level of detail to meaningfully enable a thorough understanding of site conditions and the development of remedial action alternatives. In addition, the RI/FS Report does not comply with the outline as presented in the AOC Attachment B, pages 6 through 9. For example, the AOC states that the "Source, Nature and Extent of Contamination" section shall summarize the available site characterization data for the Sauget Area 2 Site, including the locations of the hazardous substances, pollutants, or contaminants; the quantity, volume, size or magnitude of the contamination; and the physical and chemical attributes of the hazardous pollutants or contaminants." The RI/FS Report did not meet this requirement.

2. **USEPA Comment: Potential for Erosion and Release.** An important issue for this RI/FS is whether another flood such as that which occurred in 1993 could result in erosion of contaminated soils or releases from currently buried drums or other containers. Following the 1993 flood Site Q was left scoured with exposed drums. US EPA removed

over 3,200 drums and 17,000 cys of contaminated soil from Site Q. However Site Q is composed of 1,600,000 cys of waste with potential for large numbers of additional buried drums or containers. Although a substantial magnetometer survey was performed across all the sites, which identified hundreds of anomalies, only a minimal number of these were investigated by trenches. For example at Site P at least 20 substantial magnetic anomalies that could be buried intact containers occur throughout The 20 acre landfill as shown on RI Figure 5-1a, but only 1 anomaly was investigated. This issue needs to be thoroughly evaluated and remedial actions need to address the potential for future releases from sites where waste remains within the floodplain.

**The Group's Response:** The flood of 1993 was a 500-year flood event and the highest in the history of the St. Louis area. During that event, Site R and Site Q were affected, because they are located on the "wet" side of the USACE floodwall, but Sites O, P, and S were not because they are located on the "dry" side of the floodwall. The floodwall was not breached during this event. It is highly unlikely that a future flood event would occur of a magnitude (return period) that breaches the floodwall and would therefore have the potential to cause erosion and/or releases at Sites O, P, or S. No erosion of the cap at Site R was encountered as a result of the flood of 1993, and the riverbank adjacent to Site R has been armored with a significant riprap blanket since the flood of 1993. Based on this information, it is unlikely that erosion or release would occur from any of the Sauget Area 2 sites with the potential exception of portions of Site Q. The only areas of Site Q that would be expected to potentially impacted by erosion due to flooding events less than the 500 year return period would be the southern portion of Q. This is the same area in which EPA has previously removed all visible drums and containers, thereby eliminating the threat of release from this area.

The comment above states "Site Q is composed of 1,600,000 cys of waste with potential for large numbers of additional buried drums or containers." The RI/FS document refers to assumed volumes of "content" for Site Q for the purposes of developing remedial alternatives to be evaluated, but there is no indication that this "content" should be considered "waste." Furthermore, nothing encountered during the execution of the RI field effort indicated the presence of any buried drums or containers, much less large numbers of them. These efforts included a grid-based soil gas survey, a grid-based magnetometer survey, trenching to investigate those magnetic anomalies with the greatest potential to represent buried containers, and numerous drilling activities. These activities did however, confirm the presence of significant quantities of rebar and other metallic construction debris, as suspected based on past and current operations at this site.

With regard to those magnetic anomalies that were investigated through trenching, the number and location of these "anomaly" trenches was arrived at jointly by the Sauget Area Sites Group and their contractor (URS), USEPA, IEPA, and USEPA's oversight contractor (CH2M HILL) during a work session in which all parties were represented. The trenches were selected by these parties to represent worst-case locations based on all of the screening data generated, including not only the magnetometer data, but also soil gas data and GC/MS and XRF data where applicable.

**USEPA Response:** The United States Geological Service (USGS) has designated the 1993 flood as a 150- to 200-year flood event for the Mississippi River at St. Louis, not a 500-

year event as indicated above (*The Great Flood of 1993 Post-flood Report*, USGS). In addition, the entire area of Sites Q and R, west of the levee, lies within the 100-year flood plain (based on Federal Emergency Management Agency [FEMA] designation), and has been impacted by floods on multiple occasions, not just in 1993. For example, flood waters in 1973 inundated Site Q for several months during the year, and lead to the closure of the site as a landfill.

Sites Q and R are the main sites of concern relative to potential for future flooding and release. Substantial numbers of buried drums were removed from Site Q during USEPA's 2000 removal action. However, the removal action was stopped after available funds were spent. Additional drums are believed to be present in areas not excavated during the removal action and cleanup objectives in residual soils were not achieved during this removal action.

The assertion that the only area of the site that can be affected by flooding in the future is the southern portion of Site Q is not supported in the RI/FS Report by any technical evaluation, and it does not correlate with FEMA flood maps. This is an important issue for the overall protectiveness of the remedial alternatives and needs detailed evaluation. As recommended earlier in this document, the Group should prepare a Technical Memorandum (as an appendix to the RI/FS Report) evaluating whether the previous RAs sufficiently addressed the potential for erosion and release during a flood event. If the Group concludes that there is no potential for further erosion and release, it should be explained and supported in the Technical Memorandum.

The point is made by the Group that the 1,600,000 cubic yards of waste within Site Q should be referred to as landfill "contents" rather than landfill "waste." The Section 6 discussion of landfill contents is titled "Waste Material and Volume," Table-6-1 presenting landfill volumes is titled "Waste Volume" and a table on page 9-20 is titled "Summary Waste Volumes." The landfill contents are also waste based on the definition within Illinois Administrative Code (IAC) Title 35 Part 807.104: "*waste means any garbage, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility or other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, or from community activities,...*". Based on this definition of "waste", the terminology used in USEPA's original comment is correct.

The statement "*nothing encountered during the execution of the RI field effort indicated the presence of any buried drums or containers*" is inaccurate because there were numerous drums reported to be present in the test trench logs, documented in site photographs, and based on the site history. For example, USEPA was still removing drums from Site Q South in 2000 when funds ran out, thus preventing further drum removal. The RI/FS Report failed to mention and avoided discussing the fact that numerous drums were found in the test trenches by summarizing the trenching results as "*no intact* (emphasis added) *drums were identified.*" Drums disposed in landfills are often crushed during landfill operations to reduce waste volumes, so it is not surprising that many of the disposed drums would not be defined as "intact." Wastes remaining in crushed drums and in surrounding soils may still constitute a principal threat.



The Group's response indicated that adequate investigations for buried drums was conducted even though very few of the areas of elevated soil gas or the areas of magnetic anomalies were investigated by test trenching. The initial RI scope previously agreed upon during joint meetings was based on a streamlined approach with the presumption that the landfill contents and groundwater contamination would be contained. As discussed earlier in this document, this concept was not carried through the streamlined FS, but rather the minimal investigations were used to justify minimal to no remediation.

3. **USEPA Comment: Principal Threats.** A central concept of the NCP, the USEPA *Guidance for Conducting Remedial Investigations/Feasibility Study Under CERCLA* and the US EPA *Guidance Conducting Remedial Investigation/ Feasibility Studies for CERCLA Municipal Landfill Sites* is that the RI/FS identifies areas of principal threat and develops remedial alternatives that use treatment as a principal element. The NCP states in Section 300.430(a)(1)(iii): *"EPA expects to use treatment to address the principal threats posed by a site, wherever practicable. Principal threats for which treatment is most likely to be appropriate include liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials."* At Sauget potential areas of principal threat include drums and other containers buried in the landfills, areas of LNAPL and DNAPL and areas of highly concentrated soil contamination. Minimal information was presented in the RI regarding the types and quantities of materials disposed at the landfills. Also minimal investigation of magnetic anomalies was conducted and, although a soil gas survey was conducted, results were not summarized or evaluated. The site waste disposal information needs to be presented, or researched if presently unavailable (see comment below), together with the results of the magnetometer survey and the soil gas survey, so that the magnitude of the principal threat can be evaluated. Once this information has been presented, the need for additional investigation of potential areas representing principal threats can be assessed.

**The Group's Response :** The landfills, as defined by IEPA (through the Ecology & Environment report) were the potential principle threats to be investigated, not individual hot spots within each of the sites. The goal of the comprehensive remedial investigation was to address each site as a whole, and not to develop a grid-based investigation approach in an attempt to delineate hot spots of principal threat material. With regard to the potential presence of drums or other buried containers, as well as the investigation of magnetic anomalies through trenching, please refer to the relevant sections of the response to Comment #2 above. A more thorough presentation of the soil gas investigation and the magnetometer survey could be developed and presented to the Agencies if this is thought to be helpful.

The Group believes that sufficient disposal information exists and has been adequately considered in the development of the RI/FS for Sites O, P, R, and S. Because less was known about the disposal history of Site Q, particularly the southern portion, the supplemental screening studies (grid-based GC/MS, XRF, soil gas surveys, and magnetometer investigations) were performed in this area to further refine the scope of the comprehensive RI. As a result, the information that is available is adequate for decision-making purposes at these sites.

**USEPA Response:** The concept of “principal threat” is used throughout the NCP and USEPA guidance. It cannot be ignored or redefined. Given the many magnetic anomalies, many areas of elevated soil gas and the drums found in the test trenches, USEPA has identified additional test trenching that will be necessary at each site (see the attached *Additional Remedial Investigation at Sauget Area 2 Sites*). A more thorough presentation of the soil gas investigation and the magnetometer survey is welcomed. Along with this data, any associated soil and waste sampling results need to be presented and discussed in a manner that allows for easy interpretation of the potential for principal threats.

4. **USEPA Comment: NAPL Investigations.** Based on the above discussion regarding principal threats, an investigation of NAPL areas needs to be undertaken. NAPLs were reported in some samples and some groundwater concentrations exceed the 1% of solubility rule of thumb for the potential presence of NAPL. The objective should be to delineate areas of potential NAPLs in sufficient detail to support development of alternatives that address these areas of principal threat.

**The Group’s Response:** NAPL was addressed throughout the course of fieldwork in accordance with the approved FSP and reported in the RI/FS document. No evidence of NAPL was observed in any media from any sampling location at Sites O, P, Q Central, Q South, or Q Ponds. Evidence of NAPL was visually observed in one or more media (samples from waste borings, leachate wells, and trenches) at Sites R, S, and Q North. Groundwater from all of these sites is captured by the Interim Measure currently in operation at Site R, and the impacted groundwater is being treated at the ABRTF in accordance with the approved Interim Measures design documents.

**USEPA Response:** The Group’s response does not account for all NAPL issues that arose during the 2002 RI fieldwork. Please refer to the NAPL discussion earlier in this document. NAPL was not sampled in waste characterization borings when it was observed. Chlorobenzene was detected at concentrations exceeding one percent of its solubility (indicating the presence of NAPL) in groundwater samples downgradient of Site P. All the NAPL data should be elaborated upon and placed in a separate section of the RI report. All historical information on NAPL (light or dense) should be included in the RI report in addition to a fieldwork evaluation of NAPL characterization at Sauget Area 2. A discussion of the nature and extent of NAPL, vertically and horizontally, and a characterization of the material should be included in the RI/FS Report. Once the existing NAPL data have been compiled and presented, the need for additional characterization of the horizontal and vertical extent can be determined.

5. **USEPA Comment: Quantities of Materials Disposed.** Very little information is presented on the types and quantities of materials disposed at the sites in Section 1.2 Present and Past Facility Operations and Disposal Practices. Typically considerable time and effort is required to research disposal records, interview past site operators and conduct other data gathering efforts in order to quantify the types and quantities of materials disposed. Of particular concern is the lack of any quantity estimated for the reported disposal of liquid waste solvents. This is of critical importance relative to judging the potential for future releases from the sites (particularly for sites P, Q Central, and Q South for which no remediation is being proposed) and their relative importance in terms of remedial objectives. The minimal waste and source area investigations

conducted to date are those that would be conducted at sites with very minimal potential for future releases, such as former municipal landfills with limited industrial waste disposal. The industrial nature of these sites and the high levels of groundwater and leachate contaminant concentrations suggest that many areas representing “principal threats” may be present throughout these sites.

**The Group’s Response:** The Group believes that sufficient disposal information exists and has been adequately considered in the development of the RI/FS for Sites O, P, R, and S. Because less was known about the disposal history of Site Q, particularly the southern portion, the supplemental screening studies (grid-based GC/MS, XRF, soil gas surveys, and magnetometer investigations) were performed in this area to further refine the scope of the comprehensive RI. As a result, the information that is available is adequate for decision-making purposes at these sites. In terms of future releases from source areas within these sites, please refer to the response developed for Comment #14 below.

**USEPA Response:** Additional information on disposal history and quantities disposed for each site must be included in the RI report so that an adequate evaluation of principal threats can be performed. USEPA does not concur that the existing disposal information has been adequately considered in the development of the RI/FS as stated above (please refer to section on Data Summaries under RI/FS Report Deficiencies).

6. **USEPA Comment: Unsupported Conclusions.** Many broad conclusions are made in the RI/FS that are not supportable given the level of investigations conducted. As an example, in Section 5.1.1 Magnetometer Survey, pg. 5-2, the following statement was made as a conclusion based on the results of the trench investigation of magnetic anomalies: *“Magnetic anomalies observed during the magnetometer survey are likely attributable to the presence of construction debris containing steel reinforcing bar, metallic construction debris, or drum remnants.”* This broad conclusion is poorly supported because of the minimal investigation of anomalies. At Site P at least 20 substantial magnetic anomalies that could be buried intact containers occur throughout the 20 acre landfill as shown on Figure 5-1a, but only 1 anomaly was investigated. Its implication that there are no buried drums or containers in the landfills is not justified based on past discoveries and disposal history.

**The Group’s Response:** With regard to the potential presence of drums or other buried containers, as well as the investigation of magnetic anomalies through trenching, please refer to the relevant sections of the response to Comment #2 above.

**USEPA Response:** The Group’s response did not address the fundamental concern of poorly supported conclusions throughout the report. USEPA has the expectation that conclusions will be properly supported in the revised Draft RI/FS. In the example given above, the only supportable conclusion for Site P is that the one anomaly investigated with trenching did not find intact drums. If trenches had been used to investigate all magnetic anomalies and areas of elevated soil gas at the site, along with adequate site history information suggesting few drums, if any, were disposed, then a conclusion that drums of waste representing principal threats are not present at Site P would be supportable.

7. **USEPA Comment: Adequacy of Soil Investigations.** In general landfill sites do not require extensive characterization if it is clear that ; 1) areas of principal threat are unlikely to be present and 2) it is clear that the landfill at a minimum will be covered. Minimal investigations of surface and subsurface soil were undertaken given these assumptions (see the comment above relative to the first assumption on areas of principal threat). The second assumption, that the landfill will be covered at a minimum, is not true for the three sites P, Q Central, and Q South because, on the basis of the minimal sampling (e.g. Q Central has 3 surface soil samples), the risk assessment concluded there are no unacceptable risks. The FS developed no remedial alternatives for these 3 sites. Additional soil sampling is need to verify that risks related to these sites are below the NCP required risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  ELCR or HI =1.

**The Group's Response:** Additional research could be conducted to determine if other sampling efforts have been conducted at these sites, and if so, this data could be used to augment the dataset developed from the RI/FS work. Following this effort, if additional soil samples are needed to support the conclusion that no unacceptable risks exist at Sites P, Q Central and Q South, a supplemental data collection effort could be undertaken.

**USEPA Response:** We agree that pre-RI data for SA2 should be reviewed and summarized by the Group in the RI/FS Report. Additional field investigation work, outlined in the attached *Additional Remedial Investigation at Sauget Area 2 Sites*, may be modified based on the review of such data.

8. **USEPA Comment: Adequacy of Groundwater Investigations.** Additional investigation of groundwater is needed for several sites to determine if releases have occurred and/or whether groundwater contamination is related to the site. This data will be important to judging the need for interception of the groundwater plume along the entire western boundary of Area 2 versus interception of just Site R as is currently being constructed. (Note that minimal additional investigation of groundwater may be needed if it is clear that EPA will require complete interception of the groundwater from all sites- i.e., they will select FS groundwater media Alternatives 4 or 5. Note also that the FS lists these 2 alternatives as exceeding \$100,000,000.) At site P only one transect of groundwater grab sampling locations (AA-P-1, 2, and 3) was collected downgradient of the 20 acre landfill. The landfill has a width of 3,600 feet perpendicular to groundwater flow and at least 20 significant magnetic anomalies, only 1 of which has been investigated. There is not sufficient groundwater data to conclude that releases from the site that could pose a threat to human health and the environment are not occurring. A similar situation occurs for Site O. At Site Q sufficient upgradient sampling was not performed to be able to discern the source of the groundwater contamination seen in the downgradient alluvial aquifer. Also sampling data is minimal in the shallow portion of the alluvial aquifer along the river.

**The Group's Response:** The driver for addressing groundwater impacts at Sauget Area 2 is ultimately the Mississippi River. For Sites O, Q North, R, and S, the associated groundwater is captured by the Interim Measure currently in operation at Site R, and the impacted groundwater is being treated at the ABRTF in accordance with the approved Interim Measures design documents. Surface water, sediment, and biological sampling at stations representative of conditions downgradient of those sites not addressed by the

Interim Measure currently in operation (Sites P, Q Central, and Q South) all indicated no adverse impacts were present. Based on these results, additional groundwater sampling would serve little purpose to determine impacts on the River or to assess associated remedial actions.

**USEPA Response:** The premise that the only significant concern (i.e., the “driver”) is protection of the receptors in the Mississippi River is incorrect. The NCP, USEPA guidance and Illinois regulations require that groundwater in useable aquifers be returned to beneficial uses in a reasonable time frame. Certainly factors such as the likelihood of groundwater use, the potential for future releases and the potential for increasing contaminant concentrations in groundwater are central to the determination of a “reasonable time frame.” Sufficient characterization of groundwater contamination associated with Sites O, P, Q, and S is needed to allow determination of whether collection and treatment of groundwater contamination is needed at sites in addition to Site R.

USEPA has identified additional locations where shallow leachate monitoring wells and additional groundwater monitoring well nests should be installed (see the attached *Additional Remedial Investigation at Sauget Area 2 Sites*). Additional locations may be needed based on the results at these proposed locations. The issue of whether groundwater contaminant concentrations may increase in the future also needs to be addressed in the RI data evaluation.

9. **USEPA Comment: RI Data Presentation.** The majority of the RI data was presented in such a summarized level (e.g. total VOCs, total SVOCs) that interpretation of the results is difficult. The groundwater plume maps for total VOCs and SVOCs presented in the executive summary are drawn only to the arbitrary concentration of 1,000 µg/L, rather than contoured to show the full extent of the plumes exceeding PRGs. Total VOC isoconcentration maps presented in Section 7 have order of magnitude contours drawn, but often in areas where no data is available. It appears that locations with NA (not analyzed) were interpreted as ND (not detected). Contours are typically drawn indicating less contamination near the river even though data to support this interpretation is not available and no conceptual model discussions were included that might lend support to this data interpretation. Contours in the area of Q South are drawn showing contamination is largely from upgradient, although there is no upgradient data presented in this area. Contours should be shown as solid only where data is available. Dashed contours can be used where other site information is being used to interpret the likely contour location. Nearly all contours should be dashed because of the scarcity of data.

**The Group’s Response:** The presentation of RI data based on classes of compounds (total VOCs, total SVOCs, total herbicides, etc) is consistent with the approach presented in the SSP, which was submitted and approved prior to the initiation of fieldwork. The presentation of data in this format was also consistently discussed in the monthly progress meetings with USEPA and IEPA following the collection of field data and prior to the submission of the RI/FS document. To develop contour maps showing the full extent of plumes exceeding PRGs would be inconsistent with this approved approach, and inconsistent with the concept of a streamlined RI/FS. Development of groundwater contour maps, such as those presented in the RI/FS report, are always subject to

professional judgment, and interpolation of data is a commonly used, and necessary, practice in this type of assessment. Contrary to the statement above, locations with NA were not utilized as ND data points. A conceptual site model was developed and submitted with the Human Health Risk Assessment document (ENSR, August 31, 2003).

Notwithstanding the above discussion, the Group is willing to incorporate additional plume maps into the RI/FS, provided a clear rationale is developed to determine which constituents would be mapped.

**USEPA Response:** USEPA, IEPA and their consultants recall raising specific objections to presentation of oversimplified contamination maps during monthly meetings prior to the completion of the SSP. A list of specific contaminants to be contoured to the drinking water PRG concentrations is as follows:

- Chlorobenzene- present throughout groundwater at concentrations above the HI =1 value of 110 µg/L.
- P-chloroaniline- present in the Mississippi River at concentrations above acceptable risk levels and present in groundwater over a wide area at concentrations above the HI =1 value of 150 µg/L.
- Benzene- present in large areas of groundwater at concentrations above the MCL of 5 µg/L.
- 1,4 Dichlorobenzene- present in groundwater in portions of the sites above the MCL of 75 µg/L.
- Vinyl Chloride- present in large areas of groundwater at concentrations above the MCL of 2 µg/L.
- Arsenic- present throughout groundwater at concentrations exceeding the MCL of 10 µg/L.
- TCE – human health risk assessment (HHRA) constituent of concern (COC), exceeded Toxicity Characteristic Leaching Procedure (TCLP) criteria in waste, highly mobile in the subsurface and recalcitrant to degradation.
- PCE – exceeded TCLP criteria in waste, highly mobile in the subsurface and recalcitrant to degradation.
- Cis-1,2-dichloroethene – primary degradation product of TCE.
- 1,2-chloroethane – HHRA COC, exceeded TCLP criteria in waste, highly mobile in the subsurface and recalcitrant to degradation.
- 2,4,6-trichlorophenol – HHRA COC, exceeded TCLP criteria in waste, highly mobile in the subsurface and recalcitrant to degradation.
- 2,4-D – exceeded TCLP criteria in waste and recalcitrant to degradation.
- 2,4-dichlorophenol – HHRA COC and a degradation product of 2,4-D.

This list should be augmented by the Group if there are any other contaminants that are widespread in occurrence and exceed drinking water or surface water PRGs or otherwise present unacceptable risks to Mississippi River receptors. Also, much more care needs to be taken in contouring concentration levels that are supportable by data.

10. **USEPA Comment: Groundwater Plumes.** A conclusion in the Executive Summary (pg. ES-10) that plume 3, located in Site Q south, “does not appear to reach the Mississippi River”, is unsupported by even the limited data presented. Sample location AA-Q- 5 along the river and downgradient of Site Q has p-chloroaniline at concentrations up to 500 µg/L.

**The Group’s Response:** The conclusion concerning plume 3 referenced above was made with regard to the total VOC and total SVOC contour maps. As discussed above, based on the approach contained in the approved FSP plume maps for individual constituents such as p-chloroaniline were not generated.

Notwithstanding the above discussion, the Group is willing to incorporate additional plume maps into the RI/FS, provided a clear rationale is developed to determine which constituents would be mapped.

**USEPA Response:** A list of specific contaminants (including p-chloroaniline) to be contoured to PRG concentrations is provided above in Response # 9.

11. **USEPA Comment: Adequacy of Sediment and Surface Water Investigations.** Six near shore areas of sediment and river water were investigated. One of these areas (R3) was particularly contaminated and was found to present unacceptable risk. This area is south of Site R. It appears that the FS has assumed that remediation of Site R will alleviate this contamination even though it is not directly downgradient of the Site R groundwater remediation area. Given the widely spaced groundwater sampling locations, it is possible that other areas of sediment and surface water are similarly contaminated in the areas not investigated between the 6 sample areas. Of particular concern are areas between R2 and R3. Also it is important to determine whether NAPLs are present in areas between the Site R slurry wall (only 1 groundwater sampling location is present over the 1,800 foot long river frontage) and the river so that the potential for continuing releases to the river, even given the presence of the Site R groundwater remedial action, can be evaluated.

**The Group’s Response:** Station R3 did show impacts and was found to present an unacceptable risk. And while not directly downgradient of Site R, it is immediately adjacent to and downriver of Site R. Additionally, groundwater and soils data collected from alluvial aquifer location AA-Q-1 and Piezometer cluster 4, both located in Site Q and immediately upgradient of Station R3, do not indicate that Site Q is the source of the impacts seen in Station R3. Based on this information, the impacts seen at Station R3 can be logically linked with Site R and it is reasonable to assume that remediation of Site R will alleviate these impacts seen in the river. In terms of groundwater sampling station spacing and river sediment stations, alluvial aquifer locations AA-Q-2 and AA-Q-3 are evenly spaced along the riverbank between surface water & sediment sampling stations R3 and R4, and alluvial aquifer location AA-Q-5 is located equidistant between surface water & sediment sampling stations R4 and R5. The area referred to above, between

stations R2 and R3, represents the area immediately downgradient of and adjacent to Site R, which will be addressed by the interim measure currently in place. The historical aerial photo survey and the boundary trenching exercise both indicated that the waste material was confined to the area currently under the vegetative cap at Site R.

**USEPA Response:** It is not clear that impacts at Station R3 are related to Site R, particularly because these stations are as far as 500 feet sidegradient to the southernmost edge of the Site R GMCS system. It is entirely possible that significant groundwater plumes emanating from below Site Q are causing the unacceptable ecological risks in the river. Also, DNAPL was encountered in a sonic boring located outside the barrier wall capture zone, clearly indicating that DNAPL may be outside the Site R containment area. DNAPL between the wall and the river would be expected to continue to act as a source of high concentrations of contaminants to the river for decades, irrespective of the presence of the wall.

Additional investigation of NAPL, potentially between the Site R slurry wall and the river, is needed. In addition, additional river sampling is needed based on the very elevated chlorobenzene concentrations found in the Mississippi River. Given the very large dilutions expected for groundwater discharging into the Mississippi River, the potential for DNAPL near and/or below the river should be evaluated. Chlorobenzene has been found in groundwater within one percent of its solubility, which is indicative of the potential presence of NAPL nearby.

12. **USEPA Comment: Other Data Limitations.** The limitations of the data should be discussed for media such as storm water and leachate samples where the method of sample collection may substantially bias VOC results low (note sample containers were not filled and immediately sealed for these samples). Stormwater and leachate VOC results should not be used unless the VOC losses during sampling can be quantified and shown to be insignificant. Re-sampling may be necessary to prevent VOC losses during sample collection.

**The Group's Response:** Stormwater samples were collected in accordance with the approved FSP using an automated sampling device to ensure that first flush samples were collected. To use a manual sampling procedure for VOC constituents in stormwater samples would not have been practical due to personnel limitations. In other words, it would not have been possible to have someone on-site 24/7 to manually collect a first flush sample for VOC analysis. If a manual sample had been collected, it would not have been considered a first flush sample due to the time required to mobilize personnel to the site at the beginning of a qualifying rainfall event. Based on discussions with USEPA and IEPA, a first flush sample was the most important criteria, which could only be satisfied by the use of an automated sampler. Additionally, because of the transport mechanisms associated with stormwater movement and flow, VOC compounds, if present, would have likely volatilized prior to sample collection. Therefore, VOC compounds would not be expected to be present in significant concentrations in stormwater at the sample collection locations.

**USEPA Response:** The argument that we can use an inadequate sampling method that biases VOC results low because the VOCs shouldn't be present anyway is odd. The RI/FS Report should clearly state that the method of sampling significantly biases VOC



results low. It is agreed that stormwater results are unlikely to have significant VOCs. However, leachate samples are expected to have high VOC concentrations. Leachate samples for VOC analysis should be recollected by filling VOC vials directly from leachate seeps.

13. **USEPA Comment: Conceptual Model of Contaminant Migration and Fate.** A conceptual model of groundwater contaminant transport and fate was not presented. An understanding of the discharge of the heavily contaminated groundwater to the river and the subsequent mixing and dilution of the groundwater contaminants in the river water needs to be presented. This conceptual model will be useful in determining whether samples closer to shore than the 50 feet location chosen are needed and whether there is a potential for groundwater to discharge further than the 300 foot location.

**The Group's Response:** A conceptual site model was developed and submitted with the Human Health Risk Assessment document (ENSR, August 31, 2003). The sampling locations for surface water and sediment stations (50 to 300 feet from shore) were developed in consultation with USEPA and IEPA personnel, in particular their ecological risk assessment experts, and were consistent with the approved workplan for this effort. A significant amount of previous investigation work in the Mississippi River adjacent to the Sauget Area 2 sites was considered in the development of this Workplan, and included the ABRTF Aquatic Habitat Assessment (1990), the ABRTF Biological Assessment (1996), and the Solutia Surface Water Sampling Program (2000). This historical data review, as well as the results from Station R3 obtained from this investigation, support that the sampling locations are properly positioned to assess impacts to the River from the Sauget Area 2 Sites. If helpful, additional information on these other studies could be provided to better understand this issue.

**USEPA Response:** The Group's response referred to a risk assessment conceptual model that presents a box chart presenting simplistic source, pathway, receptor relationships. This is not what is meant by a conceptual model of contaminant migration and fate. All the information referenced in the Group's response above may be valuable in the development and presentation of the groundwater fate and transport model that should be presented in the RI/FS report.

14. **USEPA Comment: Source Areas.** The Executive Summary (pg. ES-10) concluded that the *"waste within Sites O, P, Q and S do not appear to currently be significant on-going sources of impact to the underlying aquifer."* The conclusion is not clear as to what is meant by "significant." Assuming the intended meaning is related to whether there is ongoing leaching of contaminants that requires control and/or source treatment, the limited data and interpretations presented do not support this broad conclusion.

**The Group's Response:** We will delete the word "significant" from future discussions. The embedded tables in Section 6, developed for each site, indicate that for Sites O, P, Q North, and S the VOC and SVOC concentrations in the alluvial aquifer increase with depth, suggesting that the waste material is not a significant on-going source to the underlying aquifer.

**USEPA Response:** There are two issues that are important relative to judging the significance of contaminant leaching to groundwater at these sites. The first is whether

leaching is occurring at concentrations that result in exceedance of groundwater PRGs (PRGs include drinking water MCLs). It is likely that this is occurring in portions of most, if not all the sites based on waste and TCLP sample results. This is an important issue relative to the need for capping and/or leachate collection and treatment. It will also be important to the judgment of whether groundwater treatment is needed to return groundwater to beneficial uses in a reasonable time frame.

The second issue is whether leaching is occurring at concentrations that could result in risks to receptors in the river. It is apparently this issue that is being judged by the Group as insignificant, even though unacceptable risks are occurring in the river.

15. **USEPA Comment: Remedial Action Objectives.** The RAOs will need to be revised once RI and risk assessment comments have been addressed and the risks related to the sites are identified. No RAOs were developed for Sites P, Q Central and Q South because risks are *"within of below the USEPA's target risk range of 10<sup>-6</sup> to 10<sup>-4</sup> and below the HI of 1."* The NCP as well as the RI/FS Guidance require that RAOs and remedial alternatives be developed whenever risks exceed the 10<sup>-6</sup> ELCR, **not just when risks exceed 10<sup>-4</sup> ELCR.** The NCP in Section 300.430 (e)(2)(i)(A)(2) states: *"The 10<sup>-6</sup> risk level shall be used as the point of departure for determining remediation goals for alternatives....."* The preamble to the NCP (FR Vol 55, No. 46 pg. 8718) provides more detail on EPA's requirement for using a cumulative risk level of 10<sup>-6</sup> as the starting point in setting PRGs. The RI/FS guidance also requires development of PRGs for the full risk range and requires development of alternatives that reflect remediation of target areas for the full risk range. The concept is that the EPA decision makers need to be able to compare alternatives that remediate to the 10<sup>-6</sup> risk range to alternatives that remediate to the 10<sup>-4</sup> risk level.

**The Group's Response:** The full text of NCP Section 300.430 (e) (2)(i)(A)(2) follows:

*"For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10<sup>-4</sup> and 10<sup>-6</sup> using information on the relationship between dose and response. The 10<sup>-6</sup> risk level shall be used as the point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure;"*

This was further clarified by OSWER Directive 9355.0-30 from Dr. Clay to the Regions in April 1991. The stated purpose of the memorandum was to clarify the role of the baseline risk assessment in developing Superfund remedial alternatives and supporting risk management decisions. The Directive states:

*"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10<sup>-4</sup>, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts."*

In addition:

"EPA uses the general  $10^{-4}$  to  $10^{-6}$  risk range as a "target range" within which the Agency strives to manage risks as part of a Superfund cleanup. Once a decision has been made to take an action, the Agency has expressed a preference for cleanups achieving the more protective end of the range (i.e.,  $10^{-6}$ )."

These excerpts make it clear that the Agency intends to regulate Superfund sites using the  $10^{-4}$  to  $10^{-6}$  risk range, where action is generally not warranted if risks are less than  $10^{-4}$ . Where the  $10^{-4}$  risk level is exceeded, the Agency would prefer cleanups at the more protective end of the range,  $10^{-6}$ , as a point of departure. In practice, remedial goals are generally derived for the  $10^{-6}$ ,  $10^{-5}$  and  $10^{-4}$  risk levels for use in risk management decision making. Therefore, no action is warranted at Sites P, Q Central and Q South because potential risks are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the HI of 1, and it is not necessary to derive remedial goals for these sites.

**USEPA Response:** USEPA does not agree with the Group's interpretation of OSWER Directive 9355.0-30 as invalidating the requirements of the NCP to use  $10^{-6}$  as the point of departure in development of PRGs and the development of remedial alternatives. The directive was focused on remedy selection rather than development of PRGs or the development and evaluation of remedial alternatives. In addition, the Group's response overlooks the need to develop PRGs for useable groundwater and to develop soil PRGs for protection of groundwater.

Soil PRGs for direct contact are not necessary if the presumptive remedy guidance is followed and all sites are covered, or if adequate investigations have been conducted and risks are below the point of departure risk levels. Soil PRGs protective of groundwater at the point of compliance (i.e. the vertical plane at the landfill edge of waste boundary) are also needed unless a site has been adequately investigated and the groundwater at the point of compliance does not exceed groundwater PRGs for useable aquifers (e.g., MCLs in this case) and is not projected to exceed PRGs in the future. Groundwater PRGs are needed because the groundwater is a useable aquifer. The issue of over what time frame the groundwater has to be restored to the PRGs will be determined based on the evaluation of remedial alternatives and other factors previously discussed. Surface water PRGs protective of aquatic life and human health are also needed for the Mississippi River unless these exposure pathways are not currently presenting unacceptable risk and are not projected to create unacceptable risk.

16. **USEPA Comment: PRGs.** The FS does not present PRGs. The NCP is clear that PRGs should be developed. Section 300.430(e)(2)(i) states: "*Establish remedial action objectives specifying contaminants and media of concern, potential exposure pathways, and remedial goals. Initially preliminary remedial goals are developed based on .....*".

**The Group's Response:** See response to Comment #17 below

**USEPA Response:** See USEPA response to the Group's response to Comment #17 below

17. **USEPA Comment: ELCR  $1 \times 10^{-4}$  COCs.** The risk assessment included only those carcinogenic COPCs that exceeded an ELCR of  $1 \times 10^{-4}$  in the list of COCs for which cumulative risks were later identified. This method would be expected to result in

underestimation of the cumulative cancer risk because COPCs presenting risks in the  $10^{-4}$  to  $10^{-5}$  risk range are not included, although they could increase the cumulative risk to levels exceeding  $10^{-4}$ . Also the COC list developed in the risk assessment are the contaminants that should be used in the FS for identification of PRGs (although, as noted above, this was not done). In Section 300.430 (e)(2)(i)(A)(2) of the NCP, the factors used to develop PRGs are listed. The NCP requires the  $10^{-6}$  risk range be used as discussed above.

**The Group's Response:** Constituents of potential concern (COPCs) were identified for each area and medium based on conservative risk-screening using the USEPA Region 9 PRGs based on a  $10^{-6}$  risk level. The risk characterization section of the HHRA combined the results of the exposure assessment and the toxicity assessment to derive site-specific estimates of potentially carcinogenic and noncarcinogenic risks resulting from both current and reasonably foreseeable future potential human exposures to all COPCs identified for a particular area and medium. The cumulative risk results of the risk characterization were used to identify the constituents of concern (COCs), which are a subset of those COPCs whose risks result in an exceedance of the target risk range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$  for potential carcinogens, per guidance cited above.

Because of the complexity of the site, and the number of media, receptors, exposure pathways and COCs identified, it is difficult at this stage to identify site-specific PRGs that account for multiple exposures and cumulative risk (e.g., for a construction worker scenario where COC-A is identified based on inhalation and dermal contact with groundwater in an excavation, and for incidental ingestion of soil in that same excavation, an almost infinite number of PRGs could be developed to account for cumulative risk by all pathways. Since the remedy itself eliminates the theoretical risks associated with these COCs, there is no need to generate voluminous PRGs for potential pathways that will not exist.

**USEPA Response:** As discussed earlier, PRGs are needed for all COCs contributing to unacceptable risk at a ELCR of  $1 \times 10^{-6}$  or  $HI = 1$ . The PRGs are needed for ELCR for the risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ . The media and pathways needed are described in the response to Comment #15.

It is agreed that PRGs representing the cumulative effect of multiple pathways are too complex. The cumulative effect of exposure to multiple contaminants also does not have to be reflected in the individual PRGs at this time. Rather, the cumulative effect of exposure to multiple contaminants is typically addressed by selection of single contaminant PRGs at the ELCR  $10^{-5}$  or  $10^{-6}$  risk levels (e.g., if there are several contaminants that are each remediated to the ELCR  $10^{-5}$  level, the cumulative risk will still be below the ELCR  $10^{-4}$  level).

18. **USEPA Comment: Soil Remedial Alternatives.** The development and evaluation of remedial alternatives will need to be redone once areas representing principal threats are identified and delineated. Alternatives that include treatment specific to the areas representing principal threat must be developed and evaluated. The Municipal Landfill guidance is clear that alternatives using excavation and/or treatment for the entire contents of a landfill are clearly not implementable and should not be developed. The alternative "Excavation, Treatment and Offsite Disposal of Soil/Waste Material" for

Sites O, Q North and R", should be deleted from the FS since containment can be considered the presumptive remedy for these sites (note this alternative for each of these sites exceeds \$500,000,000). As discussed above however, excavation and treatment alternatives should be developed for areas within these sites representing principal threats.

**The Group's Response:** Refer to Response to Comment #3 above.

**USEPA Response:** See USEPA response to the Group's Response to Comment #3.

19. **USEPA Comment: Remedial Alternative Detailed Evaluation.** Numerical rankings should not be done as part of the detailed evaluation of alternatives in the FS. Rather the RI/FS guidance, Chapter 6 Detailed Analysis of Alternatives, specifies narrative discussions. Numerical rankings are not discussed at all. The main problem with numerical rankings as performed in this FS is that they provide equal weight to each of the criteria even though some criteria may be far more important than others for this site.

**The Group's Response:** The use of numerical rankings is not prohibited or discouraged in the RI/FS Guidance, and often times provides the most clearly understood means by which to compare and assess alternatives. A concern with narrative discussions is that they can become overly complex and lengthy, leaving the reader confused and unclear as to the merits of each after reading several such narratives. Numerical systems can be developed which provide a means of weighting critically important criteria differently from less-important criteria. If narrative discussions were to be used to replace the numerical rankings, a significant amount of additional text would be developed with little, if any, clarity or benefit added.

**USEPA Response:** Narrative discussions will be necessary. Consideration for numerical rankings and criteria weightings will be discussed at a later date with the Group.

20. **USEPA Comment: Groundwater Remedial Alternatives.** Five groundwater remedial alternatives were developed, three of which include groundwater interception and treatment along the river. Two of these alternatives are very expensive, exceeding \$100,000,000. The remaining alternative is the alternative currently being constructed. An additional alternative that includes the components currently being constructed (Alternative 3) plus targeted groundwater treatment, either through collection and treatment or insitu treatment, should be included. The areas targeted would be areas outside the Site R capture zone that represent concentrated areas of the plumes and areas of the plumes resulting in potential risks related to plume discharge into the Mississippi River. Also alternatives should be developed for areas of NAPL as discussed earlier.

**The Group's Response:** Based on the results of the ecological and human health risk assessments, there is no justification for additional targeted groundwater treatment beyond that which is already operational through the Interim Measures remedy at Site R.

**USEPA Response:** Additional remedial alternatives for groundwater will be discussed following completion of additional RI investigations.

21. **USEPA Comment: Cost Estimates.** Detailed cost estimates were presented for the soil media alternatives but none were found for the groundwater remedial alternatives. Please provide detailed cost tables for the groundwater alternatives.

**The Group's Response:** The requested cost tables for the groundwater alternatives are provided as an attachment to this response.

**USEPA Response:** These cost tables were not provided as an attachment to the PRP's RtCs document that was emailed to USEPA on May 7, 2004.

22. **USEPA Comment: ARARs.** ARARs were not reviewed in detail because the nature and extent of contamination is not yet defined sufficiently and remedial alternatives are likely to change substantially from those presented once comments are incorporated. A general comment however is that sufficient level of evaluation was not performed for state ARARs involving investigation and remediation of sites having a release of hazardous substances or pesticides. As an example, the state requirement for evaluation of risks related to ingestion of groundwater (IAC Title 35 Part 742.320) evidently were not considered ARARs because such an evaluation was not performed in the human health risk assessment.

**The Group's Response:** The embedded table in Section 9 which discusses location-specific ARARs does include a reference to 35 IAC 742, with a note under the Applicability heading identifying it as "To be Considered." However, and in accordance with the approved Human Health Risk Assessment Workplan, ingestion of groundwater was not considered in the development of COPCs because groundwater in the area is not used as a source of drinking water.

**Response:** See earlier responses on the issue of useable groundwater. The NCP and EPA guidance is clear that useable groundwater must be returned to drinking water standards in a reasonable time frame.

## Risk Assessment

**USEPA Comment** The Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) were submitted in August 2003 as separate documents from the Draft RI/FS Report. Accordingly, document review was conducted in October 2003 and comments were submitted at that time. Regarding the HHRA, comments will be further discussed via conference call on March 10, 2004. The ERA comments were discussed on March 3, 2004 and general agreement was reached on the necessary revisions.

The RI/FS report summarizes the original HHRA and ERA methods and conclusions and presents the information in its original condition, prior to the incorporation of reviewer comment. Consequently, it is expected that the next revision of the RI/FS Report will incorporate the agreed upon changes consistent with the outcome of the HHRA and ERA comments and responses.

**The Group's Response:** As necessary, revisions to the RI/FS document will incorporate the latest updates to the HHRA and BERA which result from agency review and negotiation.

**USEPA Response:** The HHRA and ERA must be updated following the collection additional site data described in the attached document, *Additional Remedial Investigation at Sauget Area 2 Sites*.

## Groundwater Modeling

### General Comment

CH2M HILL has reviewed the parts of the SA2 RI/FS concerning groundwater characterization and groundwater modeling. Overall, both the characterization effort and the report are insufficient to meet the objectives of a CERCLA RI/FS. There is a consistent lack of detail that precludes verification of the conclusions. The major technical issues are described below.

### Specific Comments

1. **USEPA Comment:** The Shallow Hydrogeologic Unit (SHU) is consistently understated in its importance to the characterization and remediation of the SA2 sites. The unit consists of typical alluvial overbank deposits that are variously described as silty sand or clay. Overbank deposits are typically dominated by fine-grained sediments (silt and clay), however, sand stringers are present within this unit and leachate seeps from this unit have been documented. Whereas the groundwater flux from or through this unit seems insignificant in comparison to the deeper units, the presence of leachate seeps should not be understated. For example, ecological receptors can be exposed to undiluted leachate, especially where it occurs adjacent to the river.

**The Group's Response:** Seeps along the bank of the Mississippi River adjacent to Sites R and Q were investigated as part of the RI in accordance with the approved workplan and discussed in Section 3.8 of the RI/FS Report. During the reconnaissance effort several seeps were identified, but flows were extremely low and collection of sufficient sample quantity for laboratory analysis was difficult. The groundwater modeling work included in the RI/FS report focused on total loading to surface water, and a detailed analysis of seeps was not included or felt to be beneficial for decision-making purposes.

**USEPA Response:** Additional monitoring points to evaluate seep and SHU concentrations are required as discussed described in the attached *Additional Remedial Investigation at Sauget Area 2 Sites*. Contaminant concentrations detected in this investigation should be reviewed by the modelers to evaluate the impact on the mass flux calculations.

2. **USEPA Comment:** River stage has a tremendous impact on the rate of groundwater discharge to the river, yet there is little discussion of the frequency of river stage.

**The Group's Response:** The Interim Groundwater Remedy Design Basis report (March 31, 2002) included a sensitivity study that included changes in river stage. This report concluded:

*"The sensitivity analysis indicates that this flowrate decreases when the river stage is high and increases when the river stage is low. When the monthly average high river stage and monthly average low river stage are used in the model (with all other parameters unchanged), the*

*modeling indicates that the flowrate of affected groundwater from Site R to the river ranges from 303 gpm to 724 gpm. Sensitivity analysis also indicates that MODFLOW results are most sensitive to changes in river stage and insensitive or less sensitive to other changes."*

Frequency-discharge curves for the river were obtained by the modeling team for this project, and can be provided. Additionally, the information used for sensitivity analysis in the Groundwater Remedy Design Basis report can be provided as well to further clarify this issue.

**USEPA Response:** The addition of frequency-discharge curves and more detail on the sensitivity analysis will help clarify and add detail to the modeling effort and should adequately address this comment.

3. **USEPA Comment:** Plume boundaries are defined within the report as being equal to the 1,000 µg/L isoconcentration line for total VOCs and total SVOCs. Use of the 1 ppm line for plume boundaries understates the lateral extent of the affected groundwater and should not be used. Plume boundaries should be based either on the detection limits or regulatory standards. The plume contouring is highly subjective and needs refinement using additional wells.

**The Group's Response:** The presentation of RI data based on classes of compounds (total VOCs, total SVOCs, total herbicides, etc) is consistent with the approach presented in the SSP, which was submitted and approved prior to the initiation of fieldwork. The presentation of data in this format was also consistently discussed in the monthly progress meetings with USEAP and IEPA following the collection of field data and prior to the submission of the RI/FS document. To develop contour maps showing the full extent of plumes exceeding PRGs would be inconsistent with this approved approach, and inconsistent with the concept of a streamlined RI/FS. Development of groundwater contour maps, such as those presented in the RI/FS report, are always subject to professional judgment, and interpolation of data is a commonly used, and necessary, practice in this type of assessment.

Notwithstanding the above discussion, the Group is willing to incorporate additional plume maps into the RI/FS, provided a clear rationale is developed to determine which constituents would be mapped.

**USEPA Response:** Addition of chemical-specific plume maps showing contours to the PRG are requested and should be adequate to meet the requirements of this comment.

4. **USEPA Comment:** There are no maps showing the presence of nonaqueous-phase liquids (NAPLs).

**The Group's Response:** NAPL was addressed during the data collection effort in accordance with the protocol established in the approved Workplan, and discussed in the RI/FS report (Sections 5 and 6) on media by media basis. Delineation and mapping of NAPLs was not an objective of the Workplan or the data collection effort.

**USEPA Response:** Please see earlier comments regarding the need for further evaluation of NAPLs.



5. **USEPA Comment:** The degree of groundwater characterization is minimal, at best. For example, having one groundwater monitoring well cluster downgradient of Site R is insufficient. Also, there is insufficient data to support separation of the plumes between Sites O and R. There is too much area to cover for so few points.

**The Group's Response:** The data collection effort was accomplished in accordance with the USEPA-approved Workplan.

**USEPA Response:** Additional groundwater monitoring wells and the rationale for those locations are described in the attached *Additional Remedial Investigation at Sauget Area 2 Sites*.

6. **USEPA Comment:** Documentation of the groundwater model is lacking in detail. For example, to evaluate the degree of calibration the report presents a table of modeled versus measured groundwater levels. This comparison, presented in terms of the root mean square of the deviations, evaluates the magnitude of the deviation, but there are other aspects to calibration that are equally important. The modeled potentiometric surface should be overlaid onto the mapped potentiometric surface so that agreement between the two surfaces can be evaluated. Two maps (modeled and measured) are included, but not in the same report and the maps cover different domains and are impossible to compare.

**The Group's Response:** The requested graphical overlay can be constructed from the existing data.

**USEPA Response:** Addition of the requested graphic should be adequate to meet the requirements of this comment.

7. **USEPA Comment:** Recharge via surface infiltration was modeled at 7.8 inches per year (in/yr), however, Geraghty and Miller (1993) cited an average recharge value of 13 in/yr and a base-flow (dry condition) recharge of 8.8 in/yr. Why did the most recent model use the much lower value of 7.8 in/yr and not cite the work by Geraghty and Miller?

**The Group's Response:** The modeling work relied on a recharge estimate developed by Schicht (1965) from a flownet analysis. This same value was used "for the majority of the study area" in the regional groundwater model developed by Clark for the Illinois Dept. of Natural Resources (Clark, 1997). The Geraghty and Miller study did not indicate how they arrived at the 13-inch per year or the 8.8 inch per year value. Recharge was not used as a calibration variable in their study. Overall, it was felt that recharge estimates from Schicht's calculations were more reliable than the unknown and undocumented method used by Geraghty and Miller.

**USEPA Response:** Response accepted.

8. **USEPA Comment:** The Draft Design Basis Report (January 2002) stated that the estimated discharge rate to the river at Site R is 650 gallons per minute (gpm), however, the rate stated in the RI/FS is 535 gpm. What caused the reduction in discharge rates?

**The Group's Response:** The 535 gpm value was derived from a more recent, more refined version of the model as presented in the "The Interim Groundwater Remedy Design Basis" report (March 31, 2002).

**USEPA Response:** Response accepted.

9. **USEPA Comment:** Mass flux estimates are based on concentrations from a single location per disposal site. Such minimal coverage, particularly on those sites with long widths perpendicular to groundwater flow can result in large under or over estimation of mass flux. The mass flux estimates and source mass volume estimates are referred to as "planning-level" estimates. It is not possible to achieve the goals of the detailed analysis of alternatives, e.g., -30/ +50 percent cost estimate, on the basis of planning-level estimates.

**The Group's Response:** The data collection effort, and subsequent modeling work, was accomplished in accordance with the USEPA-approved Workplan.

**USEPA Response:** The mass flux estimates should be reviewed and revised, as necessary, following collection of additional groundwater data as described in the attached *Additional Remedial Investigation at Sauget Area 2 Sites*.

10. **USEPA Comment:** The Feasibility Study concludes that the groundwater remedy will be limited to the slurry wall and groundwater extraction at Site R because that remedy will account for 99 percent of the contaminant flux to the river. Using with percentages can be very deceiving when dealing with very large numbers. Ninety-nine percent might not be sufficient if the remaining flux still creates unacceptable risk due to discharge of groundwater to the river.

**The Group's Response:** Actual performance of the system will be verified by monitoring as presented in the USEPA-approved Performance Standard Verification Plan, developed in accordance with the October 3, 2003 UAO for the Interim Remedy associated with the Sauget Area 2 Groundwater Operable Unit.

**USEPA Response:** In order for this approach to be acceptable, the additional wells described in the attached *Additional Remedial Investigation at Sauget Area 2 Sites* must be installed.

11. **USEPA Comment:** Mass flux estimates to the river at Site R were calculated using a different process than the other sites. For Site R the length of the site perpendicular to groundwater flow was subdivided into multiple zones for which the mass flux was individually calculated and then summed to develop a value for the entire site. There are no maps in the report that show the zones or the data that was used to estimate the concentration of contaminants within each zone. This process is much more definitive than that used on other sites, but the data need to be presented. A similar process should be used for all of the sites.

**The Group's Response:** A map showing the subdivision of the sites into zones can be provided. Note that some low-concentration areas of Site R were not included in the mass flux calculation. Site R has been the subject of numerous investigations over the course of many years, and as a result a significant dataset has been developed for this site. Compared to Site R, the other sites with Sauget Area 2 do not have the same data density, nor would it be beneficial to develop such, so the method used at Site R cannot be reproduced at the other sites.

**USEPA Response:** The mass flux estimates should be reviewed and revised, as necessary, following collection of additional groundwater data as described in the attached *Additional Remedial Investigation at Sauget Area 2 Sites*.

## Laboratory Data Quality Evaluation

### General Comments

#### 1. USEPA Comment: Section Four, Data Validation

- a. The limitation imposed on this section by the author to discuss only rejected data, as opposed to any data that does not meet QAPP requirements, leaves the reviewer with little information regarding PARCCs. There are project data quality objectives and data usability factors that can be affected by data quality indicators that do not meet the project QAPP even if the data are not rejected.
- b. PARCC discussions for each method are vague, and do not leave the reviewer with quantitative information regarding these indicators. Phrases such as “generally acceptable” should be replaced by specific information regarding the quantitative data quality indicators that have led to these conclusions. The discussions should mirror the guidance in Section Three of the Quality Assurance Project Plan, 4/15/2002. For instance:
  - i. Precision – Was precision assessed with MS/MSD and FD data? Did the assessment follow the QAPP guidelines?
  - ii. Accuracy – Was accuracy assessed using the LCS and/or MS/MSD recovery? Did the assessment follow the QAPP guidelines?
  - iii. Representativeness – Were both field and laboratory procedures reviewed to ensure that representativeness is maintained?
- c. We suggest adding specific information for all PARCC parameters for each method/matrix combination.
- d. We suggest that each section by method should contain a table of sample/analyte/concentration/final validation flag so that the reader can make an independent assessment of the impact of data flagging on data usability
- e. We suggest a focused section of overall project completeness to show that the 90 percent goal was met.
- f. Specific comments on Section Four, including Tables 4-1 through 4-13, are listed below in Table 1.

#### 2. USEPA Comment: Appendix H, Data Validation Reports

- g. Section Four, Data Validation, refers to the data validation reports in Appendix H. We chose what appeared to be a representative report (SAII06) for multiple analytical methods.

- h. It is difficult to quickly assess the usability of the associated data because there are no summary tables of affected samples, analytes, and associated flagging.
- i. The reader is referred to a completed data validation checklist, supporting documentation, and an explanation of the data qualifying flags. It is difficult for the reviewer to get a complete picture of the impact of the observed findings on the usability of the data because all of the necessary information is not easily recovered and collated with the report.
- j. Although professional judgement is expected to be used during the final data usability assessment step, it is generally expected that the project QAPP be strictly adhered to during the initial data verification/validation step. It is not clear that the QAPP was followed in all cases in this validation process.
- k. Specific comments on Appendix H are listed below in Table 2.

## Specific Comments

**TABLE 1**  
Specific Comments, Section Four Data Validation

Item	Section	Table	Comment
1	4.1	NA	Please verify where the "Data Validation Plan (URS, 2001b)" has been approved by the QAPP for use.
2	4.1		Paragraph 2 – This paragraph appears to be misplaced and not an introductory topic.
3	4.2	NA	For clarity, define the numbers of samples, methods, sample delivery groups and matrices that are involved in the validation/sample program.
4	4.2	4-1 through 4-13	Table 4-1 through 4-11 are not clearly defined. Tables should, for ease of use, stand alone with correct footnotes and definitions as needed. Table 4-13 helps to clarify the use of the tables 4-1 through 4-11 but is cumbersome. The "total" row in the header of each table is not clear but is assumed to be a count of all possible target analyte records for each method/matrix combination. If true, it is not possible to evaluate individual target analytes for data quality issues. This is important in that the data quality objectives for the project focus on specific target analytes with respective risk evaluation/ screening criteria objectives. Suggest presenting the tables focused on method/matrix/target analytes. This would enable the reviewer to determine if, for example the 12 percent rejected data, 15 targets, from SW8081A in storm water samples are all the same target analyte. If they are then it is unlikely that the data quality objectives for that target analyte have been met.
5	4.2	4-1 through 4-13	An explanation of the impact on data usability based on the contents of Tables 4-1 through 4-13 by analyte would be the minimum information expected in a data quality evaluation report.
6	4.2	4-1 through 4-11	The tables should be self-sufficient. Clarifying footnotes and/or more descriptive column headings are needed for each table.
7	4.2	4-12	X, N, NJ are not found in Tables 4-1 through 4-11.
8	4.2	4-12	The "Notes" at the bottom of this table are unclear. They call for information "presented below," yet they are at the end of the table.
9	4.2	4-13	The "Notes" at the bottom of this table appear to be text instead of notes.

**TABLE 1**  
Specific Comments, Section Four Data Validation

Item	Section	Table	Comment
10	4.2.1	NA	The author suggests that the requirement for minimum response factors is a carryover from older programs. If the data quality objectives can be met with other QC limits for this parameter, we suggest that either the project QAPP or the project working documents be modified to represent this approach. If the stakeholders agree with this assessment, less data would be rejected for use.
11	4.2.2	NA	Please explain the sample "affected by serious 'carryover' from a previous analysis" comment. If there is a more detailed discussion of this in Appendix H, please direct the reader to the appropriate section.
12	4.2.3	NA	Please clarify the statement "display a more than usual bias and/or variability." This is a non-quantifiable state left open to the interpretation of the reader.
13	4.2.3	NA	Please explain the rationale for calling surrogate failures as matrix effects. Were chromatograms reviewed to verify interference or did the author rely on laboratory case narrative discussions?
14	4.2.3	NA	It is not clear that the completeness objective and overall project objectives for the BHC analytes have been met. Table 4-11 does not lend itself to determining if the BHC compounds meet the risk-based project objectives or if there is a potential data gap.
15	4.2.3	NA	Out of control surrogate spikes are noted to be low recoveries in the Accuracy bullet. Associated sample results should not demonstrate a potential high bias. What matrix is impacted by 10 percent unusable data in this discussion?
16	4.2.3	NA	The completeness discussion notes that the failure of the BHC compounds in the air matrix are associated to a method limitation. Please expand the discussion of this limitation and state why this method was chosen to meet project objectives.
17	4.2.3	NA	Sensitivity – Please explain the matrix interference comment.
18	4.2.4	NA	If confidence is high that the extraction process was less than accurate for the LCS vessel due to cracks that allowed for solvent leakage, the incident was isolated, and the associated MS/MSD passed all QC criteria, thereby demonstrating the efficiency of the extraction process, it would seem that these data could be recovered for project use and the "R" flag removed. A loss of almost 24 percent of all sediment herbicide results would possibly represent a data gap for completion of project objectives. The reviewer states that the data "may be used, albeit cautiously."
19	4.2.5	NA	Please define the criteria used to reject data based on a matrix effect. How was this identified? Please show where the QAPP defines rejecting data for matrix effects.
20	4.2.5	NA	What is a "fraction" when referring to PCB analysis?
21	4.2.6	NA	Clarify if the dioxin/furan analytical results over the calibration range have been qualified as estimated concentrations.
22	4.2.6	NA	Representativeness – What does it mean, "the representativeness of the data is generally complete?"  Completeness – What does it mean that the "completeness is generally acceptable?" Please specify the completeness by analyte.  Sensitivity – The discussion of sensitivity refers to "reasons described above." Please clarify what reasons the author is referring to.

**TABLE 1**  
Specific Comments, Section Four Data Validation

Item	Section	Table	Comment
23	4.2.6	NA	The last paragraph introduces the geochemical parameters but there is no associated supporting data validation discussion. We suggest possibly moving the last paragraph to Section 4.2.8. The reference to a section "below" this paragraph leads nowhere.
24	4.2.7	NA	All summary information for this method is very vague.

**TABLE 2**  
Specific Comments, Appendix H, DSG SAIL06

Item	Section	Comment
1	Intro	What is the QAPP guidance on data validation? Does it include using NFG and method guidance in addition? Explain how NFG applies to methods not in the CLP program.
2	Major Anomalies	What are the associated samples and analytes affected by these quality indicators?
3	VOC	Flagging based on out of control MS/MSD results is a professional judgement condition; however, the reviewer has the following comments. The MSD is out of control with a high bias and the precision between the NS and the MSD is also out of control for specific compounds. It is unknown from the information available if the sample concentrations associated to the high bias are detections or not, but if detected, "J" flags should be applied to note the estimated concentrations. The imprecision between the MS and the MSD may also require flagging of sample results.
4	VOC	Concentrations over the calibration range are flagged "J" and are still available for project use. How is the recommendation for using the diluted value disseminated to the project team?
5	SVOC	Use of the term "marginal" is subjective. A difference of 39 percent (assumed high bias) is not marginally out of control to this reviewer. Marginal should be clarified.
6	Pesticides	Four samples have out of control precision between the primary and confirmation column for detected target analyte concentrations. It is noted that the laboratory reported the lower of the two values for project use. A conservative approach would require the higher of the two values to be used for project objectives.
7	Pesticides	Does the QAPP say not to qualify data if anomalies are surrogates, analytes meet other column criteria, or associated sample results are non-detect?
8	Pesticides	Last sentence – What guidance does the QAPP give to the laboratories when the RPD is out of control between primary and confirmation columns?
9	Herbicides	MCPP and MCPA are out of control with an extreme high bias in the MS/MSD. It is not clear if these targets are detected or not. No results were qualified so the assumption is that they are not detected. Please confirm. What is native sample result to spike amount ratio?
10	Metals	Is the QAPP procedure being followed when multiple QC exceedances apply to one result?
11	Dissolved Gases	See comment 6, Pesticides, above.
12	Wet Chemistry	There is no discussion presented to document that the wet chemistry parameters were evaluated.

**TABLE 2**  
Specific Comments, Appendix H, DSG SAI106

Item	Section	Comment
13	PCBs	There is no discussion presented to document that the PCB parameters were evaluated.

**The Group's Response:** Prior to undertaking the field investigation, a Data Validation Workplan was presented to and approved by USPEA. This Workplan outlined the methods and approach to be utilized in validating the collected data. Additionally, discussions were held with USEPA staff and contractors during routine progress meetings concerning the approach of focusing discussions in the RI/FS report on rejected data, and no objections were raised at that time.

**USEPA Response:** The reviewer has no way to determine that variance to the project documents were authorized, as no variances or amendments to project documents are presented with the plans.

Most of the specific comments related to the data validation have not been addressed and it is not possible to determine if the data validation workplan was followed. Responses to the specific comments would be necessary to make that assessment, as well as an assessment of whether or not the project goals were met.

**The Group's Response:** Given the complexity of the data validation process and the large amount of laboratory analyses performed during the course of implementing the Sauget Area 2 Sites Support Sampling Plan, it was considered appropriate to discuss only the unusable (rejected) data in Section 4, Data Validation of the Sauget Area 2 RI/FS Report. A summary of unusable (rejected) data allows the reader to assess the effect of this rejected data on the remedial investigation results (Sections 5, 6 and 7), risk assessments (Section 8) and the remedial alternative evaluation process (Section 9). Tables 4-1 through 4-13 of the RI/FS Report were compiled to quantify the percentage of usable that was carried forward in the RI/FS process and the percentage of rejected data that was not used in the RI/FS. A recapitulation of this summary is given below:

**USEPA Response:** The author should meet USEPA minimum standards as presented in EPA Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8, November 2002). This guidance states: "The purpose of a data validation report is to provide a summary of the data validation to the data user before the data quality assessment begins. In most cases, the data validator's report is the primary means of communication between the data validator and the data user, so it is important that the report reflects all of the details of the of the data validation..... The data validation report should emphasize any deficiencies encountered and clearly describe the impact of such deficiencies on the overall data quality. If data qualifiers were part of the data validation process, a summary of the data validation qualifiers, definitions, assignments, and reason for assignments should be included in the data validator's report..... The report describing the data validation process should provide sufficient detail for the data user to have a overall idea of the quality of the data and how well the project needs were met."

**The Group's Response:**

Parameter	Method	Unusable Data
VOCs	Method 8260B	0.7 Percent
SVOCs	Method 8270C	1.1 Percent
Pesticides	Method 8081A	2.2 Percent
Herbicides	Method 8151	3.4 Percent
Dioxins/Furans	Method 8280A/8290	0.1 Percent
Metals	Method 6010B	0.0 Percent
Mercury	Method 7471	0.0 Percent

Very little of the analytical data were classified as unusable, which is an important point for the reader to understand. Of the 93,875 organic analytical results, 93,067 (99.14%) were used in the RI, HHRA, ERA and FS. All of the metals data were used. A high degree of data usability is of fundamental importance to the data analysis and decision-making performed the Sauguet Area 2 Sites RI/FS. A very high degree of data usability was attained. This is an important point and it is the fundamental purpose and outcome of the data validation process.

**USEPA Response:** This response seems to indicate that the only validation measurement of value is whether data is rejected or not. This discounts the importance or the value of other data validation flagging that may impact the use of data. For example, if results have been estimated non-detects near a action/regulatory level, the proper understanding of the this qualified data may influence how the data is used in risk assessments, remedial investigations, and remedial alternative evaluations.

**The Group's Response:** The Agency's comments appear to require that Section 4 include a comprehensive discussion of the entire data validation process because "the PARCC discussions for each method are vague, and do not leave the reviewer with quantitative information regarding these indicators" (General Comment 1b). As indicated in Section 4 of the RI/FS Report, "a detailed and exhaustive discussion of every flag applied would serve little purpose other than to make the identification of significant issues difficult to observe" (Page 4-2, Para. 1).

A summary of unusable data is still considered the appropriate approach for informing the reader about the information used in data analysis and decision-making in the RI/FS. To avoid confusing the reader, the PARCC discussions could be moved to Appendix H."

**USEPA Response:** See previous response concerning USEPA QA/G-8 guidance. The data reviewers should have the option of examining the details of the data validation process to varying extents, depending on their expertise or perspective. The document as written does not allow such a review and is unprecedented for this type of study.



# Additional Remedial Investigation at Sauget Area 2 Sites

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This document outlines additional Remedial Investigation (RI) for the Sauget Area 2 (SA2) Superfund Sites. The additional RI must be undertaken by the Sauget Area 2 Sites Group (the Group) to satisfy the requirements of the Administrative Order on Consent (AOC; Docket Number V-W-01-C-622, signed by USEPA Region 5 on November 24, 2000) for the SA2 sites. The additional RI *"shall be consistent with the USEPA guidance entitled 'Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA' [OSWER Directive No. 9355.3-01, October 1988] and any other guidance that U.S. EPA uses in conducting a RI/FS"*.

The document is being submitted concurrently with USEPA's responses to the SA2 Sites Group's Responses to Comments (RtCs) document, hereinafter referred as USEPA Responses to the Group's RtCs. The approach presented in this document was developed by USEPA in consultation with the Illinois EPA following a review of the following information:

- The SA2 Sites Group's RtCs document submitted on May 7, 2004
- Remedial Investigation / Feasibility Study (RI/FS) Report for the SA2 sites, submitted January 30, 2004
- Precursor submittals to the RI/FS Report (e.g., April 2003 Support Sampling Plan Data Report)
- Historical information including previous investigations and removal actions at the SA2 sites

The additional RI presented in this document is subject to change (e.g., may increase or decrease) depending on information presented in a revised RI/FS Report (per recommendations in USEPA Responses to the Group's RtCs), a summary of historical disposal practices and pre-RI investigative results and removal actions, and any other data gaps observed following the completion of additional RI described herein.

If USEPA's Presumptive Remedy Guidance is followed and the SA2 sites will be presumptively capped, the scope of additional RI may be modified. However, regardless of the Group's intent to implement a presumptive remedy at a given site, additional RI must be sufficient to adequately characterize principal threats, such as non-aqueous phase liquid (NAPL) and buried drums, as described further in USEPA Responses to the Group's RtCs.

## Test Trenching

Because of the large number of magnetic anomalies, additional trenches need to be dug and additional soil samples need to be collected at the individual SA2 sites in order to adequately investigate the potential principal threat of buried drums.

The rationale for additional trenching is as follows: trenches should be completed where unexplained magnetic anomalies were found and where the soil gas survey measured elevated concentrations of volatile organic compounds (VOCs).

A composite soil sample should be collected from trenches that exhibit either drum remnants or elevated Photoionization Detector (PID) readings. The grab sample aliquots for the composite sample should be biased toward locations where drum remnants are found or at locations where elevated PID readings are observed during trenching. Samples for VOC analysis cannot be composited, so they will be chosen from the area with highest PID readings.

The number of trenches at each site depends on the proposed status of the site. For example, if No Further Action (NFA) is proposed for the site, then more vigorous investigation should be completed to justify that proposed outcome.

The following paragraphs summarize the additional trenching and soil sampling measures.

### **Site P**

The RI/FS Report recommended NFA status for this site. One anomaly trench was excavated during RI fieldwork.

At least four additional test trenches should be excavated at Site P in areas where elevated soil gas readings were measured, collecting soil samples as described above. This is based on the assumption that the site will be capped because it was a permitted landfill. If this site is not capped, additional investigations of about 20 significant magnetic anomalies may be warranted.

### **Site Q North**

The RI/FS Report proposed a cap for Q North. One test trench was excavated during RI fieldwork.

Unexplained magnetic anomalies were discovered in Site Q North; high concentrations of contaminants were detected in the river samples adjacent to Q North; and dense non-aqueous phase liquid (DNAPL) was observed in a boring located southeast of the barrier wall location. Site Q North was divided into two areas in order to best evaluate the path forward – Q “Dogleg” (adjacent and upgradient of Site R) and Q North Main (the remainder of Q North).

**Q North Main:** Test trenches should be excavated to investigate all unexplained magnetic anomalies. No locations with elevated soil gas levels were found during the soil gas survey. Soil samples should be collected from each trench following the procedures outlined above.

**Q Dogleg:** No further investigation is required as the area will be capped and the Groundwater Migration Control System (GMCS) and barrier wall will capture releases. Please note that NAPL was observed at Site Q Dogleg – this issue is addressed in a Principal Threat discussed in the USEPA Responses to the Group’s RtCs.

### **Site Q Central**

The RI/FS proposed NFA status for Site Q Central.

Additional trenches should be dug at all unexplained magnetic anomalies and/or locations with elevated soil gas levels per the soil gas survey. Further, the Group should review the 1995 Remedial Action (RA) information to determine if additional locations need to be investigated. Soil samples should be collected from each trench following the procedure outlined above.

#### **Site Q South**

The RI/FS proposed NFA status for Site Q South.

Additional trenches should be dug at all unexplained magnetic anomalies and/or locations with elevated soil gas levels per the soil gas survey. Collect additional soil samples as necessary. Further, the Group, through conducting the historical data evaluation, should review data pertaining to the 2000 RA to determine if additional locations need to be investigated (this RA was terminated due to lack of funding and known contamination remained following the RA's termination).

#### **Site Q South - Ponds**

A remedial alternative of filling the Site Q Ponds is proposed in the RI/FS Report. No test trenches should be required within the ponds.

#### **Site R**

The RI/FS Report recommended a cap for Site R.

The potential for a release from buried drums to migrate offsite through groundwater is being addressed by the GMCS and a barrier wall that is currently being installed. For this reason, no further test trenches are recommended.

#### **Site O**

The RI/FS Report recommends a cap for Site O.

Based on a cursory review of the site's disposal history, the potential for buried drums appeared to be minimal. For this reason, no magnetic survey was performed during the 2002 RI. Waste characterization samples were collected in areas where high soil gas VOC levels were measured. It is recommended that five soil borings be completed and subsurface soil samples collected in the southern portion of Site O near the elevated soil gas at location SG-O-28. One boring should be completed at the SG-O-28 location, and the four remaining borings should serve as "step-out" locations from the central boring. Each boring should be advanced, at a minimum, to the depth of the water table.

#### **Site S**

The RI/FS Report recommends a cap for Site S.

Roughly 14 unexplained magnetic anomalies were identified at Site S, and high soil gas readings were indicated. One anomaly trench was excavated during RI fieldwork, and in four of five trenches excavated at Site S (anomaly and boundary) drum remnants were observed. The site is located partially upgradient from Site R, where the barrier wall is being installed. Although there were relatively few magnetic anomalies observed at the site, there

is a concern that soil contamination could potentially be an on-going contributor to groundwater contamination. NAPL has been observed at Site S.

Additional trenches should be dug at all unexplained magnetic anomalies and/or locations with elevated soil gas levels per survey. Soil samples should be collected as necessary.

### **Surface Soil Sampling**

Thirty-eight surface soil samples were collected during RI fieldwork. Following Presumptive Remedy guidance, if the site will be capped, further investigation of surface soil will not be necessary. However, if a cap is not proposed for a site, substantially more surface soil sampling will be required in order to adequately characterize human health and ecological risk.

At sites where capping is not proposed, the number of surface soil samples needed from a particular site will vary based largely on the size of the site and certain statistical goals. In general, larger sites will require more data than small sites, and sites with highly skewed datasets will require more samples than sites with low data variability. As a starting point, results from a minimum of ten surface soil samples should be available for each site. Based on the data distribution of the ten samples, additional samples may be necessary to properly calculate the 95 percent upper confidence limit (UCL) concentration to be used in the human health risk assessment (HHRA). For instance, if the data is so skewed that normality is rejected (via the Shapiro-Wilk test for normality) with ten samples, then additional samples may be required. Additionally, the Illinois Tiered Approach to Corrective Action Objectives (TACO) guidance (a "To Be Considered" guidance document) should be consulted in reference to surface soil sampling frequency.

### **Subsurface Soil Sampling**

No further investigation of subsurface soil should be required at sites where a landfill cap is proposed. At Site O, as noted above, five soil borings should be completed in the southern portion of the site. At the remaining sites, subsurface soil information would be sufficiently provided through the additional trenching and composite soil samples described above.

### **Waste Characterization and Leachate Sampling**

Nine leachate samples were collected during the RI and subsequent quarterly sampling of leachate wells. Only three of seven installed leachate wells contained a sufficient volume of leachate to sample. These wells were completed at the bottom of the waste field, directly above native soils.

Consequently, to evaluate the potential for leaching, four monitoring wells should be installed into the uppermost five feet of the Shallow Hydrogeologic Unit (SHU) water table at each of the following sites: Site Q Ponds, Site Q South, Site Q Central, Site Q North Main, Site O, and Site P. Because Site S is substantially smaller than the other SA2 sites, only two monitoring wells are recommended at Site S. Eight wells should be installed at Site Q South because of the large area of the site. The depth interval of these wells would provide the greatest likelihood of observing impacts of leachate migration from the buried waste into groundwater. Wells are not recommended at Site R and Site Q North Dogleg, as leachate generated by these sites will be intercepted by the GMCS and the barrier wall being built at

Site R. Wells should be sampled once for RI/FS purposes to assess leaching, and subsequently in a future long-term monitoring program to determine whether waste impacts are migrating to groundwater.

At sites where no landfill cap is proposed, chemical concentrations in all leachate/shallow groundwater samples will need to fall at or below Maximum Contaminant Levels (MCLs) or Preliminary Remediation Goals (PRGs) in order to justify an NFA determination.

At areas where a cap is proposed (e.g., Sites O, Q Central, and Q North), if a potential for leachate migration is found following further investigation, the FS will need to evaluate the applicability of installing a leachate collection system as part of the cap design.

## Groundwater Sampling

Additional groundwater characterization is needed to:

- Evaluate the potential for an ongoing release from the source area to determine whether additional source remediation and/or control will reduce contaminant flux to the aquifer.
- Fill data gaps identified in the RI/FS groundwater characterization.
- Evaluate the impact of aquifer anisotropy on the direction of plume movement.

Shallow groundwater quality at the landfills should be evaluated by sampling leachate and groundwater as recommended above. Pending the results, further investigation of shallow groundwater directly beneath the landfills may not be necessary.

Sites O, P, Q North, Q Central, Q South, and S will require the installation of additional downgradient monitoring wells in the Shallow, Middle and Deep Hydrogeologic Units (SHU, MHU, and DHU). The part of site Q North adjacent to Site R (i.e., the “dogleg”) may not need additional wells if the groundwater underneath this site is captured by the GMCS. A nest of shallow, middle, and deep wells should be installed and sampled at one or more locations for each of the sites to complete groundwater characterization.

Wells should be installed to develop a more sophisticated the Conceptual Site Model for describing groundwater flow and chemical fate and transport, and also to improve the understanding of contaminant plume distributions. The groundwater characterization and evaluation of remedial alternatives centers on the assumption that groundwater flows at right angles to the potentiometric contours (i.e., flow is at right angles to and towards the river). Alluvial depositional environments are typically anisotropic, as a result of the heterogeneity (lateral and vertical) of aquifer matrix. Often, groundwater flow tends to be parallel or sub-parallel to the river channel. An indication of the potential for anisotropic flow can be seen in the plume maps from the RI/FS. For example, Figures 7-1a and 7-1b in the RI/FS Report show an elongation in the plume originating at or upgradient of Site O. The plume is elongated to the north in the direction of Site P. The effect of anisotropy has a large impact on the capture of groundwater by the GMCS and whether groundwater near Site O is captured by the recovery system.

USEPA recommends adding the following additional wells (moving from north to south):

1. A profile of at least three well clusters should be installed in the area between Site P and the river to provide delineation of the plume, particularly in the DHU as shown on

Figure 7-1c. These wells would also aid in evaluating the effects of anisotropy on the direction of plume movement.

2. At least three well clusters should be installed between Sites O and P to evaluate the source and direction of movement of the plumes that appear to emanate upgradient of Site O.
3. Two well clusters should be placed within Site Q North. One cluster should be situated to provide plume delineation and source evaluation. The second cluster should be installed immediately upgradient of the river sampling location R3 and downgradient of the boring location where DNAPL was observed (Sonic 5). The high concentrations of chlorobenzene and p-chloroaniline in this sample indicate the presence of NAPL along the river bank upgradient from R3.
4. One well cluster should be placed at Site Q Central to provide plume delineation and source evaluation.
5. Three well clusters should be placed at Site Q South: one immediately upgradient of the river sampling location R5, one at Piez-7 (or sample Piez-7) and one on the upgradient of the "hot spot" at well AA-Q-6. The well cluster adjacent to the river will identify concentrations of contaminants discharging to the river. Figure 7-1b shows an open contour in the upgradient direction of the hot spot indicating potential contribution from another source. The upgradient well could be used to verify the source area.
6. One well cluster should be placed on the southern edge of the downgradient Site S plume to provide plume delineation, source evaluation, and potentially evaluate the presence of NAPL.

## Sediment and Surface Water Sampling

Additional river sampling is needed to delineate the nature and extent of specific contaminants, particularly p-chloroaniline. Insufficient data exist to determine whether the Site R barrier wall and GMCS will solve the problem of high p-chloroaniline concentrations in sediment and surface water adjacent to Site Q North. The highest levels of p-chloroaniline were detected adjacent to Site Q North, and this contaminant was the primary ecological risk driver for the Mississippi River along SA2.

The area adjacent to Site Q North and Site Q Central is a potential data gap and may be a hot spot for aquatic impacts; these areas require further investigation as they are potentially located outside of the barrier wall capture zone. DNAPL is a concern in this area due to the high chlorobenzene level detected at the river sample location R3BM and the presence of DNAPL found at the Sonic 5 boring location. The monitoring well clusters proposed for Site Q North should address this potential from the river bank. The existing monitoring wells downgradient of the barrier wall location at Site R should be sampled to investigate the potential for DNAPL, specifically the well cluster located in the southwest corner of Site R (these wells have not been sampled since their installation in 2003).

In addition, surface water and sediment samples should be collected at Site Q North and Site Q Central. Samples from two transects across the river should be collected, with upgradient and downgradient samples of the transect similar to the sample collection

conducted for the Ecological Risk Assessment (Section 12 of the Support Sampling Plan, URS, 2002).

**TABLE 1**  
Summary of Recommended Additional Remedial Investigation at Sauget Area 2 Sites

	Proposed Remedy	Test Trenches	Surface Soil Sampling	Subsurface Soil Sampling	Leachate Well or SHU Well in Source / Landfill Area	Groundwater Monitoring Well Clusters (1 well each in SHU, MHU, and DHU)	Surface Water and Sediment Sample
Site O	Cap	0	0 <sup>1</sup>	5 <sup>1</sup>	4 <sup>1</sup>	3 <sup>1</sup>	0
Site P	NFA	4	0 <sup>2</sup>	0	4	3	0
Site R	Cap	0	0	0	0	0	0
Site Q Dogleg (part of Site Q North)	Cap	0	0	0	0	0	0
Site Q North Main	Cap	All magnetic anomalies	0	0	4	2	1 transect <sup>3</sup>
Site Q Central	NFA	All magnetic anomalies and/or elevated soil gas	10	0	4	1	1 transect <sup>3</sup>
Site Q South	NFA	All magnetic anomalies and/or elevated soil gas	10	0	4	3	0
Site Q Ponds (part of Site Q South)	Filling Ponds	0	NA	0	4	0	0
Site S	Cap	All magnetic anomalies and/or elevated soil gas	0	0	2	1	0

**Notes:**

<sup>1</sup> Based on a review of historic information, and evaluation of the 'potentially contaminated area' to the northwest of the current Site O boundary (an area of prior 'known' polychlorinated biphenyl [PCB] and dioxin contamination), all sampling and monitoring well installation requirements will likely be reevaluated.

<sup>2</sup> Although the RI/FS Report does not propose a cap or soil cover for Site P, a cap or soil cover is required because the RI Report indicates that portions of Site P do not have a soil cover. Because Site P is an existing Illinois-permitted landfill, soil cover is required in accordance with 35 Illinois Administrative Code (IAC) Parts 810 and 811. The sample numbers shown for Site P assume that the site will be appropriately capped or covered.

<sup>3</sup> At each river transect, sediment and surface water samples will be collected in a sampling pattern as utilized previously (i.e., the baseline ecological risk assessment [BERA]), samples will be collected at 50, 150, and 300 feet spacing from the river bank, and upgradient and downgradient of the transect.

All samples collected will be analyzed for a full suite of parameters including VOCs, semi-volatile organic compounds (SVOCs), pesticides, herbicides, PCBs, dioxins, and metals following procedures established in the Support Sampling Plan (URS, 2002).